THE NE CORNER PROJECTS ENVIRONMENTAL ASSESSMENT (EA)
4.1-12 MANAGEMENT AREA - C280,281,282,283,284,285,286,287
SHANNON COUNTY

DONIPHAN/ELEVEN POINT RANGER DISTRICT
MARK TWAIN NATIONAL FOREST
DONIPHAN, MISSOURI

FEBRUARY 2004

Introduction

The purpose of this Environmental Assessment (EA) is to document the results of the environmental analysis for the proposed vegetative management activities in the NE Corner Projects Area on the Doniphan/Eleven Point Ranger District of the Mark Twain National Forest. This EA documents the expected environmental consequences of implementing the proposed action and provides a comparisons of consequences for implementing alternatives to the proposed action. It documents the comparison of alternatives to the proposed action. It also documents the comparison of alternatives regarding their ability to meet the purpose and need for action. It is not a decision document. The Responsible Official's (District Ranger) decision will be documented in a Decision Notice (DN).

Location of Project Area

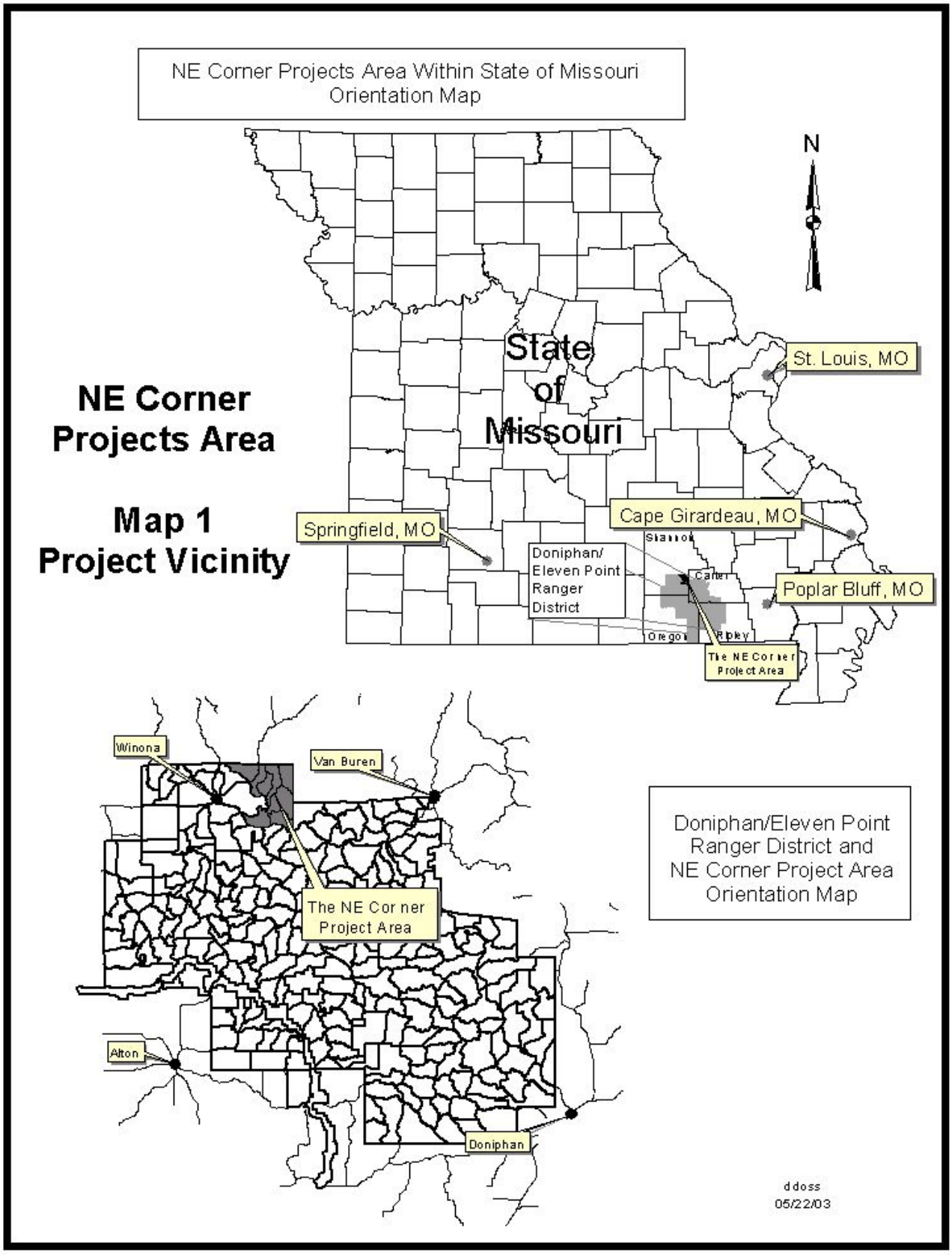
The NE Corner Project area is located in Management Area 4.1-12 containing Compartments 280, 281, 282, 283, 284, 285, 286, & 287. The legal description is: Township 27 North, Range 3 West Sections 1-28, and 30 in Shannon County, Missouri. The area considered for the Environmental Effects Analysis corresponds to the boundaries 4.1-12 Management Area, excluding Compartment 288 and 300.

Most project area compartments are east of Sycamore Creek, with Compartments 280 and 281 south of Pike Creek being the exceptions. The north boundary is adjacent to the Rocky Creek State Conservation Area, and the Peck Ranch State Conservation Area is immediately to the east of the project area. The analysis area contains 7414 acres of National Forest land and approximately 3281 acres of private land for a total of 10695 acres (See the Project Vicinity Maps on pages 2 & 3). Attached maps show treatment stands by compartment. Stand Information reports from the Combined Data Systems (CDS) database for the project compartments are available on request. The proposed project would take place only on National Forest land.

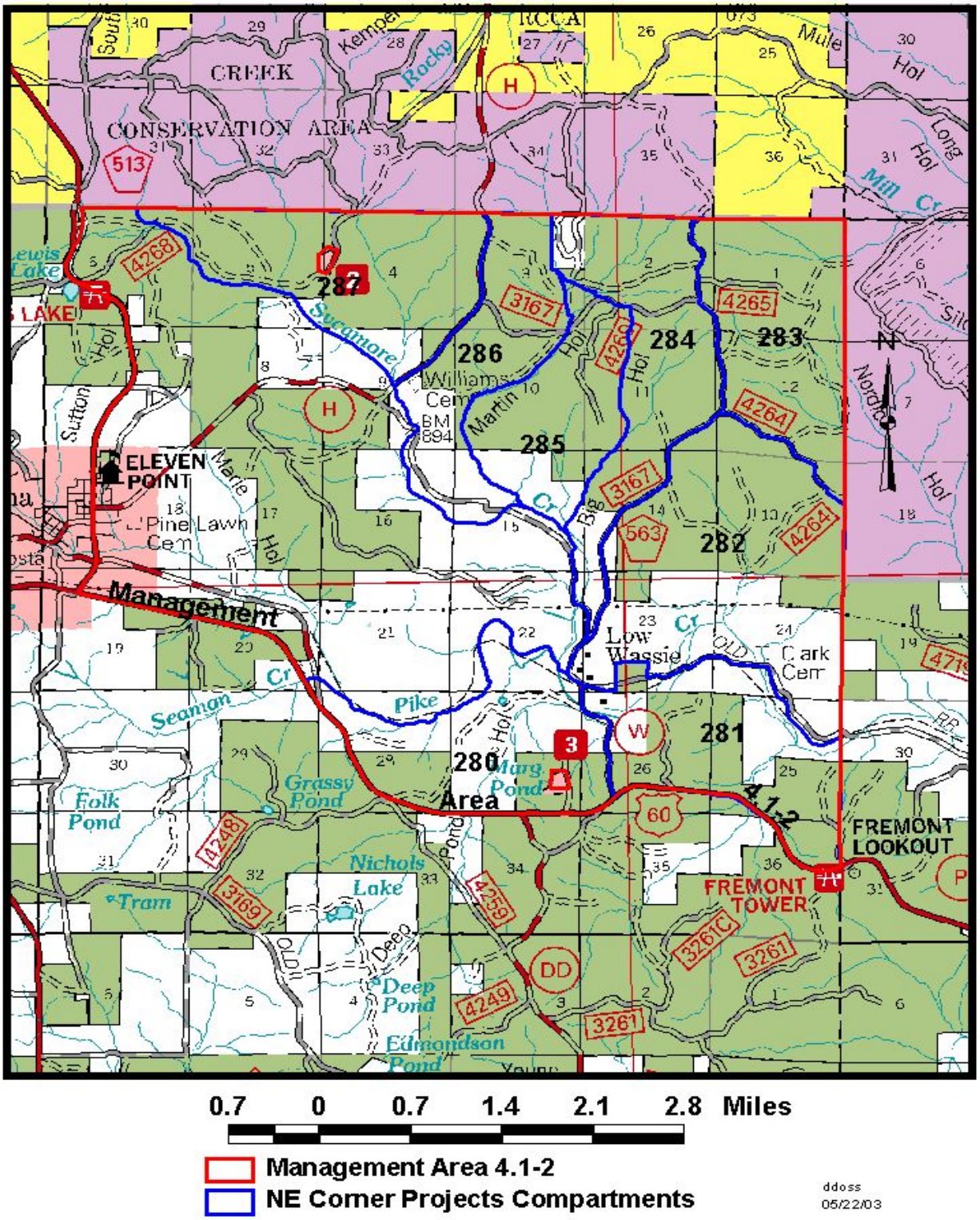
Purpose and Need

Purpose for the Proposal

The Mark Twain National Forest uses an ecosystem analysis process to meet the spirit and intent of ecosystem management adopted in 1992. This process starts with delineating and describing the ecological setting of the area, usually the appropriate watershed and additional areas appropriate to the intensity and context of expected impacts to a given resource. The ecological setting includes past and foreseeable future actions that have or will occur in this area, respectively. The Council for Environmental Quality's Eleven Principles for Incorporating Consideration of Biodiversity into NEPA Analysis (1993) is also used to evaluate site-specific proposed actions as a part of a larger ecosystem management scenario (See CEQ Eleven Principles on pages 97-106 of this EA). The process continues with descriptions of the natural communities, processes that create and maintain those communities, and existing and desired conditions, leading to identification of opportunities for action and limiting factors.


NE Corner Projects Area Within State of Missouri
Orientation Map
N
State of Missouri
St. Louis, MO
NE Corner Projects Area
Map 1
Project Vicinity
Springfield, MO
Cape Girardeau, MO
Doniphan/ Eleven Point Ranger District
Poplar Bluff, MO
The NE Corner Project Area
Winona
Van Buren
The NE Corner Project Area
Alton
Doniphan
Doniphan/Eleven Point Ranger District and NE Corner Project Area Orientation Map
ddoss
05/22/03

NE Corner Project Area Map



The Mark Twain Forest Plan, approved in 1986, provides broad direction regarding multiple use management, sustained yield of goods and services, and allocation of land and measures necessary to implement forest management programs and protect National Forest resources. It described how different areas of land would look and what resources could be provided from these lands now and in the future. The Forest Plan FEIS (Final Environmental Impact Statement) displayed the forest-wide effects of implementing forest programs, such as timber management, wildlife habitat management, recreation management and visual resource management. The site specific effects of those practices were not part of the Forest Plan FEIS. Each district must assess the condition of resources on that district in light of expected forest outputs and desired future conditions identfied in the Forest Plan.

The Mark Twain National Forest is in the process of revising the existing Land and Resource Management Plan (Forest Plan) for the National Forest. A Notice of Intent to revise the Forest Plan was issued in 2002. As part of this process, various inventories and evaluations are occurring. Additionally, the Forest is in the process of developing alternative land management scenarios that could change the desired future conditions for areas on the Forest or could change the standards and guidelines for managing specific areas. A Draft Environmental Impact Statement (DEIS) will be published in the near future that will disclose the consequences of the different land management direction scenarios considered in detail.

As a result of the Forest Plan revision effort, the Forest has new and additional information beyond that used to develop the existing Forest Plan. This information will be used where appropriate in the analysis of this project to disclose the effects of the proposed activities and any alternatives developed in detail.

The decisions associated with the analysis of this project will be consistent with the existing Forest Plan for the Mark Twain National Forest. Under regulations of the National Environmental Policy Act (40 CFR 1506.1), the Forest Service can take actions while work on a Forest Plan revision is in progress because a programmatic Environmental Impact Statement for the existing Forest Plan already covers the actions. Additionally, the decisions on this project will not prejudice the ultimate decision of the Forest Plan revision effort. The impacts on the Forest Plan revision in this project area will be disclosed in the Final Environmental Impact Statement (FEIS) for this project.

This analysis of the NE Corner Projects Area presents the site-specific effects of implementing the proposed action and alternatives to the proposed action, and is tiered to the Forest Plan FEIS. General discussions from that FEIS will be summarized and incorporated by reference into this EA. The The NE Corner Projects area is within Management Area 4.1-12 of the Doniphan/Eleven Point Ranger District.

Management Prescription 4.1-12 – Desired Future Condition

States: "Generally these management areas will be 2,500 acres or more in size. The management of shortleaf pine on suitable sites is emphasized on management areas assigned this prescription. Other plant communities occur in substantial quantities. Forest age and size class distribution will vary across the landscape. Theses areas will normally have substantial road access. Some roads may be closed periodically to meet management area objectives. Road network density will normally not exceed 2 miles per square mile of National Forest System land. All road classes, transmission line and pipeline corridors and other related facilities will be permitted. Facility design and density will be in harmony with a natural appearing environment. Mineral exploration and development may be permitted and coordinated with surface resources. Those wildlife species associated with shortleaf pine forest and early and mid-successional stages of vegetation will be favored. Man-induced controls may be readily evident to the forest user"

"Interaction between users will be low to high depending on the specific location. A variety of recreational opportunities will exist. The opportunity to experience solitude, independence and closeness to nature may be present. It is not guaranteed to the user due to intrusions of other activities. This management area can provide opportunities for forage outputs. Fire management cost can be high due to large pine management investments."

Desired Future Condition and Existing Condition Comparison
(with Resulting Need Statements and Proposed Actions That Address The Need)

The following proposed actions identified for the project area resulted from identifying current conditions which do not meet the DFC or which need to be maintained in order to meet the DFC. Management of vegetation would produce the conditions (DFC) and goods and services described for Management Prescription 4.1-12. A *(1)* indicates the corresponding purpose(s) for the proposed actions.

Provide 0-9 Age Class Habitat:

1. Provide for temporary increase in forage in woodland habitat through creation of 0-9 year old forest vegetation. Current 0-9 year old woodland habitat for the project area is 0% (based on the planning period of 1998-2007; the management area being 1%) for which these projects are proposed with a Forest Plan objective of 8-15%. (1,4,5)

Action 1a: Regenerate approximately 33 acres using shelterwood seed cuts that would leave 20-30% of the overstory trees for a seed source.

Action 1b: Regenerate approximately 88 acres using seed tree cuts that leave 4-5 good quality seed trees per acre for a seed source.

Action 1c: Regenerate approximately 338 acres using clearcuts that leave scattered individual or, in small groups, selected reserve trees such as snags and den trees. *(Note: A Certified Silviculturist has determined that stand conditions make proposed even-aged regeneration harvests appropriate to those stands and that clearcutting is the optimal method on acres proposed for this even-aged regeneration method.).*

Action 1d: Regenerate approximately 42 acres using uneven-aged management at the stand scale (group selection). Selected groups would create openings 1/3 to 2 acres in size with all trees harvested
Action 1e: Following regeneration harvest, all non-commercial trees over 6 feet tall would be felled to encourage sprouting on 314 acres. This would not include den trees, snags, fruit-bearing wildlife trees and reserve trees. These actions are site preparation done to encourage natural regeneration. One hundred and eighty nine (189) acres would be planted (167 acres of clearcut and 22 acres of seed tree seed cut).
Action 1f: Remove individual oak and pine in a shelterwood prep cut on approximately 57 acres within the oak-pine forest type to create conditions favorable to the establishment of oak and pine regeneration to perpetuate the oak-pine forest type. The production of commercial forest products would be a byproduct of perpetuating this forest type.

Provide Forested Stands That Provide Old Growth Habitat Conditions Now or in the Future

2. The Forest Plan Standard for old growth habitat is 8-10% (4,5)
Action 2a: Designate approximately 157 acres (2.1%) of project area to add to the 552 acres (7.5%) of existing designated old growth for a total of 709 acres (9.6%) of project area woodland habitat to provide old growth habitat in the future.

Provide/Maintain Open and Semi-Open Habitat Conditions

3. The amount of open/semi-open land in the project area is below the Forest Plan standard of 4-10% (currently approximately 2.4%) for this habitat component. Existing open land communities need to be maintained, as well as shortleaf pine woodland communities developed to meet the standard for this type of habitat (1,4,5)

Action 3a: Prescribe burn 34 acres to maintain existing open land and an additional 658 acres to initiate development of pine woodland habitat.

Provide for Healthy, Resilient Forests

4. Trees within the red oak group are declining and dying in several stands throughout the project area (4,5)

Action 4a: Remove the dead, dying, and mature trees within the red oak group on approximately 114 acres to reduce this component on these acres. This would be done to improve the overall condition of the forest and remove weakened forest trees susceptible to forest pests and disease (such as the red oak borers currently impacting the Salem and Potosi Ranger Districts).

5. Several stands in the project area have or would have too many trees per acre, resulting in competition for water, nutrients, and sunlight that results in decreased vigor, decreased growth rates, and decreased resistance to stress (insects, disease, and drought) (2,3,5)

Action 5a: Thin 1660 acres of pine and mixed oak-pine to improve growing conditions for young oak and pine trees, increase growth rate and vigor of residual overstory trees, and increase overall stand's tolerance of environmental stresses. A byproduct of this thinning would be commercial forest products.

Action 5b: Thin 439 acres of young oak and pine saplings to maintain rapid growth. This thinning would not result in commercial forest products.

6. Several stands in the project area appear to be suitable for the application of uneven-age management based on existing species composition and structure. The Forest Plan direction (page IV-37) includes the identification of situations that permit application of the uneven-aged silvicultural system (4,5)

Action 6a: In addition to group selection cutting (Action 1d), further develop uneven-age structure and improve species composition through the commercial and non-commercial removal of individual trees (improvement cutting) on approximately 389 acres. A byproduct of the commercial thinning would be forest products

Providing A Safe Forest Transportation System (at an appropriate level for management and reasonable public access)

7. A network of non-system roads exist in the project area that are not approved for use through the Forest Plan, as amended (3,4)

Action 7a: Approximately 13 miles of non-system roads that are not designated as part of the Mark Twain National Forest Transportation System by the Forest Plan or added to the system through Forest Plan amendment and that are determined not to be needed for resource management access and protection would be closed, obliterated, and returned to resource production (habitat, wood products, water, forage). Closure would be accomplished through placement of earthen mounds (berms), logs, rocks, or signs at the entrance of such roads that physically or legally prohibit use. Sections of these roads that are experiencing erosion or have a high potential for erosion (steep gradient, erodible surface material, exposed to weathering, or other similar factors) would be water-barred and seeded to an appropriate seed mix for erosion control.

Associated or Connected Actions

The following existing system roads (11 miles approximate) need reconstruction to provide access for proposed management activities and to maintain the standard of development approved in the Forest Plan. These Forest Road Numbers are: 3167B, 3167C, 4099, 4263, 4264, 4265A, 4268, 4273, 4274, 4296, 4713, 4713A, 4714, 4715, and 4716. Another 10 miles (approximately) would require maintenance. These Forest Road Numbers are: 3167, 4099, 4100, 4264, 4265, 4268, 4269, and 4298. Approximately 31 miles of skid trails would be estimated for designation in timber sale contract administration based on proposed actions in this NE Corner Project. This would be the estimated equivalent of 40 feet of designated skid trail per acre of proposed actions. Proposed actions involve an estimated 4165 acres (GIS). Five miles of temporary road would be constructed for timber harvesting. Skid trails and temporary roads would be closed and revegetated (as needed) after harvesting is completed. All miles listed above may not receive management actions. These determinations would be made prior to decision , except in the case of skid trails, if specific roads or road segments are found NOT to be needed or reconstruction and/or maintenance will be too costly.

Some actions require other actions in order to be accomplished. These actions would be considered in the environmental analysis of this project. All action acre totals and road miles are estimates based on current Geographical Information System (GIS) and Combined Data System (CDS) acres/miles. Some adjustments to estimated acres are expected as appropriate to protect resources, reconcile GIS and CDS acreage and mileage differences, add, subtract, or adjust actions to address public issues, and provide for the application of sound professional judgment in placing treatment unit boundaries and prescriptions on the ground.

Actions listed on pages 10-13 reflect an opportunity analysis that attempted to identify all conditions needing treatment to bring them to or towards a Desired Future Condition. Some changes may occur in actions listed, as issues and concerns are identfied and addressed throughout the analysis process. The description of alternatives on page 20-25 reflect any changes that have occurred to the original opportunity analysis proposals.

Decision to be Made

The Forest Service line officer (District Ranger) is responsible for deciding whether to:

- Not implement any proposed action alternative by selecting Alternative I (the No Action Alternative).
- Select management actions described in the Proposed Action (Alternative 2), Alternative 3, or an alternative that results from 30-day comments to this proposed action.
- Require the development of an environmental impact statement.

This environmental assessment documents the comparison of alternatives regarding environmental impacts and ability to reach or move toward the desired future condition. The decision will be based in part on the ability of the chosen actions to provide resources in an environmentally sensitive way and in response to issues and concerns identified by the public and the interdisciplinary team which developed the analysis.

The scope of the decision to be made is confined to a reasonable range of alternatives aimed at implementing the Forest Plan on the area of National Forest System Land (NFSL) described as the NE Corner Projects area (Compartments 280-287) within the 4.1-12 MA of the Doniphan-Eleven Point Ranger District, Mark Twain National Forest, Shannon County, Missouri. The decision is not one of land allocation, nor is the analysis intended to look at every possible combination of activities.

The scope is further constrained by Forest Plan Standards and Guides for the 4.1 Management Area and the associated prescription, which places the emphasis on the management of shortleaf pine. Alternatives which violate the Forest Plan will not be developed.

Public Involvement

Existing Potential Issues

In accordance with laws and regulations, factors such as vegetation, wildlife, threatened and endangered species, water and air quality and cultural resources would be addressed in the analysis. The proposed action would likely develop unresolved conflicts or concerns that reflect opposing views concerning these and other factors. These concerns, or issues, would be used to develop a reasonable range of alternatives so the deciding official can make an informed decision. Other concerns or issues may develop as a result of public comment. Several preliminary issues have been identified by the interdisciplinary team for consideration in the analysis of the NE Corner Project. This includes, but is not limited to the following:

- Forest health and vigor
- Protection of cultural resources
- Threatened, Endangered, or Sensitive Species habitat may be present and need to be protected.
- The proposed activities may conflict with hunting and may need seasonal restrictions
- Cumulative effects of management actions in the NE Corner Project Area and those of the adjacent Peck Ranch and Rocky Creek State Conservation Areas would also be considered.

Issues Identified During Scoping

A Scoping Report and cover letter were mailed to interested parties, as well as neighbors within or adjacent to the project area on January 31, 2003. Scoping letters asked for any issues relevant to the site-specific locations of the proposed projects. Previous to the Scoping Report mailing, the NE Corner Project had been on the Forest's Schedule of Proposed Actions (SOPA) since July 2002 (4th Quarter FY2002). The public was also notified of the project in a legal notice published February 5, 2003 in the Current Wave Newspaper of Eminence MO. On April 28, 2003, the ID team met for the second time to discuss comments received from scoping, identify issues in those comments and develop alternatives to the proposed action from the issues. A summary of the comments received identified the following issues and concerns:

One phone call from Hank Dorst of Mark Twain Forest Watchers was received (comments documented) and issues identified were:

- ✓ Old growth should be designated in blocks versus dispersed stands
- ✓ Maintain large trees characteristic of old growth in stands proposed for treatment.

One letter was received from Noel Poe, Superintendent of the Ozark National Scenic Riverways, National Park Service in Van Buren and the issue identified was:

- ✓ Sediment, both fine and coarse sediment, produced by proposed actions (particularly roads), may enter losing streams in spring recharge areas (NE Corner Project area is within the Big Spring recharge area).

There was one twenty-page letter requesting consideration of numerous issues, concerns, and topics from Jim Bensman of Heartwood. In general, Heartwood comments are repeated from project to project with little to no site-specificity. Most comments are stated opinion. Some address, in a general way, the same issues raised by more site-specific comments of others. These comments are best addressed in the general analysis of direct, indirect and cumulative effects in the environmental documentation. Many comments are simply accusations about and disagreement with Forest Service policy and practice. The following are a listing of those numerous issues, concerns, and topics that can be identified in Heartwood's comments.

- ✓ Logging is an inappropriate use of the public forests and is contrary to the public interest.
- ✓ The Purpose and Need is too narrowly defined to provide the opportunity to develop alternatives that do not contain logging (beside the No Action alternative) which, therefore do not give the Deciding Officer alternatives to choose from that respond to the public's will.
- ✓ Natural processes that create early successional habitat must be shown by analysis to be inadequate in meeting the need for this type of habitat created by timber sales.
- ✓ Biodiversity must be addressed in regard to all species through a wide range of variables.
- ✓ Fragmentation must be addressed in regard to all species through a wide range of variables.
- ✓ Secondary impacts must be addressed for the effects of logging on the balance of interdependent species populations (no species identified in comment), increased deer numbers, songbird decline, road kills, wind throw, and wildlife mortality/suffering.
- ✓ Compliance with the Migratory Bird Treaty Act
- ✓ Baseline data site-specific to the project area for Management Indicator Species (MIS), forest interior birds, reptiles, and amphibians must be obtained prior to proposing and/or implementing projects.
- ✓ Disclosing the impacts of proposed actions on soil (including soil microorganisms) and water quality.
- ✓ Proposed actions will increase on fire danger, introduce and spread invasive exotic species, increase water flow and sediment to caves and springs.
- ✓ Roads not on the Forest Transportation Plan inventory must be closed permanently and ripped, re-contoured, and revegetated.
- ✓ Baseline data and analysis of effects must include reptiles and amphibians, bats, and unique plant communities.
- ✓ The Forest Service overlooks timber theft by failing to follow its own policies.
- ✓ An alternative banning exports should be considered.
- ✓ This proposal will result in below-cost timber sales.
- ✓ Group selection using area regulation creates ecological traps, resulting in species failing to reproduce due to predation and cowbird parasitism.
- ✓ Implementation of the proposed action will result in the death of Indiana bats.

Comments Received on the Proposed Action (Submitted for 30-Day Review)

There were four submissions constituting comments on the proposed action distributed for 30 days under 36 CFR 215. Two submissions (Heartwood/Missouri Forest Alliance and Ozark Chapter, Sierra Club) were received via the automated reply inbox at: comments-eastern-mark-twain-eleven-point@fs.fed.us. Heartwood's comments were submitted by Jim Bensman, Missouri Forest Alliance's Jim Scheff co-signed onto Heartwood's comments and Dee Dokken submitted for the Ozark Chapter, Sierra Club. One submission came in the mail from Cory Ridenhour of the Missouri Forest Products Association. Finally, verbal comments were made by Hank Dorst during a phone conversation with David Doss, District NEPA Coordinator/Integrated Resource Analyst documented as received at 4:25 PM on November 7, 2003. All comments were timely and are summarized below.

Hank Dorst's comments were:

- ✓ The Proposed Action Report was not a proposed action but a display of alternatives
- ✓ Not all of the desired changes/additions to old growth stands that Mr. Dorst had identified in scoping comments submitted were affected.
- ✓ Compartment 281/Stand 1 is a good old growth opportunity due to existing old growth characteristics in this stand.
- ✓ The Proposed Action Report referenced mitigations on page 20 however, there were none.

Cory Ridenhour's comments were:

- ✓ We support your proposed actions to provide 0-9 age habitat and request that the Forest Service carefully evaluate the feasibility of maintaining all pine, mixed pine-hardwood, and hardwood stands.
- ✓ We support some old growth component throughout the forest but urge the Forest Service to carefully evaluate the quantity, quality and distribution of old growth stands throughout the forest.
- ✓ We realize the need for semi-open habitat, especially for wildlife, but urge the Forest Service to look at establishing, when and where possible, open areas by an E.A.M. (even-aged management?) process, at least on the short term.
- ✓ We support your proposed action for providing healthy forest, however we hope that as much thinning as possible will result in yielding commercial forest products.
- ✓ We encourage the Forest Service to work with MDC and the University of Missouri to find the best solution to managing our hardwood forest (oaks) to lessening the impact of oak decline.
- ✓ We support providing for a safe forest transportation system, but would point out that road closures can cause negative public relation problems for the Forest Service.
- ✓ Forest roads provide access to forest users for a variety of uses, especially hunting. Hunting and fishing have a significant positive impact on the economy of Missouri, especially in financially depressed areas of Missouri.

Dee Dokken's comments were:

- ✓ The Ozark Chapter, Sierra Club wants to see the Mark Twain National Forest managed for ecosystem health, biodiversity on a landscape scale, protection of watersheds and for non-destructive forms of recreation.
- ✓ The Sierra Club supports thinning and prescribed burns wehere needed to reduce the risk of fir around communities. We oppose Forest Service actions that promote future fire risks. Heavy cuts that result in dense, unhealthy stands in 30 years should be avoided.
- ✓ We would like to see the natural disturbances that always occur, i.e. tornadoes, insects infestations, etc. produce the diversity in age classification that is called for in the Forest Plan.
- ✓ We prefer Alternative 3 over Alternative 23 because it allows for slightly more Old Growth.
- ✓ Adding Compartment 282/Stand 59 to the Old Growth block is a good idea. Some compartments still have very fragmented Old Growth components such as Compartment 284.
- ✓ The Sierra Club is in favor of re-introducing fire into the Ozarks in sites where it pre-existed prior to Eurpean settlement, we are frustrated that such burning is eliminated in the same Alternative 3 that maximizes Old Growth designation.
- ✓ We would like to see an alternative that manages for ecosystem health without commercial logging. The No Action alternative does not necessarily represent this position.
- ✓ It is good to see the consideration of the 31 miles of skid trails and the cumulative effects of management actions in this area will be considreed with those of adjacent Peck Ranch and Rocky Creek State Conservation Areas.
- ✓ The Sierra Club thinks that there should be an EIS for this project.

Jim Bensman/Jim Scheff comments were:

Logging is an inappropriate use of the public forest and is contrary to the public interest.

All laws that apply to the project need to be followed.

Not providing an EA to comment on is consistent with the new regulations, it is not consistent with the Appeal Reform Act (16 USC 1612).

We assert that comments pertaining to the appropriateness of timber sales and other policy and management issues are within the scope of the proposed action and specific to the action in that they pertain directly to the motivations, the purpose and need, and design of the proposal. These types of comments, and specifically thoses in this comment letter, must be considered and constutute eligibility to appeal.

In the NE Corner document there are also some particular concerns that need to be addressed:

1. On page 7 of the EA, the Forest Service outlines three types of regeneration cuts, Actions 1a, 1b, 1c, and 1d (shelterwood, seed tree, clearcuts, and group selection respectively). Action 1e states that "following regeneration harvest, all non-commercial trees over 6 feet tall would be felled to encourage sprouting on 314 acres". Does Actrion 1e pertain to followup actions to 1a-d or is does it refer to entirely different acres? This is not clear.

2. The project area is integrally related to adjacent private land. How is the FS included the status of the adjacent private land in it's analysis of the perceived needs of the project area. The status of of adjacent private land needs to be included in the discussion and analysis of any proposed action.
3. The Forest Service needs to reassess the rediculousness of it's standard for old growth habitat (8-10%) and apply this reassessment and it's corresponding assumptions to the NE Corner project. Is one to seriously believe that over any given hundred or so year period that the Ozarks underwent catastrophic events at such a scale and frequency that only 8-10% of the forest was left intact?
4. The continuing red oak borer "problem" and the prepodnderance of red oak borer mortality over the past few years is a result of a maturing even-aged forest dominated by drought intolerant red oaks, a condition created after clearcutting led to even-aged forests.

Problems 1-4 need to be addressed and defended consistent with the OMB and USDA Information Quality Guidelines.

Public Opinion (summarization) – Public opinion poll presented that indicates some general pubic opposition to logging on national forests. Former Chief Jack Ward Thomas is quoted as charcterizing this public opinion as "about evenly split about whether we should harvest timber from national forests or not". Comment calls for consideration of alternatives that do not include logging and that the No Action alternative is not an acceptable substitution. The comment claims the Forest Service is predisposed not to select No Action.

Scientists Call For End To Logging National Forests – Comment requests consideration of a letter co-signed by 200+ scientists which call for an end to commercial logging on national forests.

Need For Timber Sale (summarization) – Comment questions need for timber sales and requests that analysis consider why natural processes will not create early successional habitat in sufficient quantity to eliminate the need for timber sales to create such habitat.

Biodiversity (summarization) – Comment requests consideration of biodiversity at all levels of diversity (regional landscape, community/ecosystem landscape, population/species, and genetic) and for all species. Comment asks for consideration of pre-settlement condition of the project area as a benchmark with which to compare the existing condition and proposed changes.An emphasis on neotropical migrant birds is noted in the comment. Comment lists numerous variables for consideration both at all levels of diversity and variables for consideration in the context of their histroical ranges of natural variability.

Fragmentation (summarization) – Comment requests consideration of fragmentation most often with regard to neotropical migrant birds. Comment requests consideration of all levels of fragmentation that exist and that will result from implementing an alternative(s). Comment requets that fragnmemnatation effects be considered for all species. Comment lists numerous variables for consideration relating to fragmentation, such as impacts to T&E species, sensitive species, old growth opportunities, amount/distribution of late successional habitat, uncommon habitat, habitat compromised by edge effect, road less areas, and habitat patches by seral stage, forest type, size distribution, preimeter/edge ratio, degereen of connectivity, degeree of structural contrast and population viability for species or feeding guilds prone to fragmentation effects. Comment requests consideration of early sucessional habitat on private land.

Secondary Impacts (summarization) – Comment requests consideration of topics such as the impacts on the balance of interdependant species populations, increased deer numbers, decreased songbird declines and associated impacts to forest growth due to reduced insect-eating bird numbers, impacts of roads on wildlife mortality, isolation of species, and the posubility of blowdown.

Impacts On Plants & Animals In The Sale Area (summarization) – Comment requests consideration of direct and indirect wildlife mortality in timber sale harvest units. Comment requests consideration of humane and anti-cruelty laws and there appliaction to wildlife mortality in timber sale units.

Migratory Bird Treaty Act or MBTA (summarization) – Comment suggests that analysis give consideration to possible violation of the provisions ogf the MBTA by loggers in implementing timber sale actions.

Baseline Data (summarization) – Comment requests that Forest Service obtain baseline data via field surveys on all Management Indicator Species(MIS), forest interior birds and reptiles and amphibians. Comment suggests the need for an adequate monitoring plan be in place for plant and animal surveys in all seasons, population and threat trends for threatened, endangered, sensitive, and MIS species and at District, Forest and Regional levels. Comment requests consideration and disclosure of all monitoring done in the project area.

Physical Environment (summarization) – Comment requests the consideration of the following attributes of the physical environment: carbon holding capacity, nitrat levels, impacts to soil and water quality, and impacts to aquatic communities. Comment on water quality includes a request to consider 16 factors that relate to aquatic habitat quality and site-specific Best Management Practices or BMP's. Comment requests consideration of the nutrional value of plants in created openings.

Fire Danger – Comment requests the consideration of how the timber sale will increase the fire danger and how far a fire could spot and the danger to nearby structures.

Exostic Species – Comment requests consideration of how the timber sale could possibly introduce and spread invasive exotic species.

Caves, Springs, & Groundwater (summarization) – Comment requests the consideration of groundwater and subsurface water flow increases through caves and from springs due to timber sale actions. Comment also requests consideration of temperasture change and increased sediment.

Roads (summarization) – Comment requests consideration of any road not on the Transportation inventory be closed, as well as roads that exceed Forest Plan standards for number of open roads. Comment requests that road closures in place be enforced, damage to roads and bridges from logging trafic be disclosed, and that direct, indirect, and cumulative effects on local residents/landowners also be disclosed.

Invertebrates & Microorganisms – Comment request consideration of impacts to soil microorganisms (fungi & bacteria), completion of inventories of these organisms, and impacts of compaction, vegetation removal, and erosion.

Dead & Decaying Wood (summarization) – Comment request consideration of the dead/decaying wood component of the forest ecosystem, how many standing/fallen dead trees there would be in a healthy natural forest, current staus of this component, and the effects of the proposed action on this important habitat.

Fish & Wildlife – Comment requests consideration of reptile and amphibian decreasing populations around the world, impacts to salamanders, status of native fisheries & mussels, stream habitat quality compared with historic conditions in the project area, Forest and region-wide, population trends of exotic or introduced species relative to native fisheries and mussels in the project area and the impacts the project will have on these populations.

Bats (summarization) – Comment makes several staenmenst about bats and their habitats. Comment requests Forest Service prohibit logging, mining, off-road vehicle use, applications of chemical agents, prescribed burning in or near areas of known bat populations (particularly known summer roosting areas and hibernacula) and the gating/monitoring in or near caves to identify malicious activities.

Unique Plant Communities – Comment requests identification and protection of all T&E species (as well as species considered for this status), all state-listed species and all sensitive species.

Timber Theft (summarization) – Comment suggests the need to consider timber theft and alleged Forest Service failures to control this and other illegal activties (such as illegal ATV operation).

Need For The Sale (summarization) – Comment suggests that other sources can provide society's need for wood (such as state and private land) and this should be considered in the analysis. Comment also request consideration of need for project area to provide wood products and need to ban wood product exports.

Recreation (summarization) – Comment requests consideration of the impacts of the project on all aspects of forest recreation, the ability of private land to provide recreation and timber (versus National Forest land providing those goods and services) and disclosure of jobs/income created by recreation to compare with those jobs/income created from logging.

Economics (summarization) – Comment alleges project to be below-costs and requests analysis as a below-cost sale. Comment suggests that the following costs be included in the economic analysis: Road costs (construct/reconstruct & wera/tear), county payment, land survey, sale administartion costs, sale preparation costs, planning (including silvicultural exams), reforestation and timber stand improvement costs, general administration costs, building depreciation, Washington/Regional Office overhead, and law enforcement. Comment request consideration of the economic value of a standing forest such as carbon storage, flood prevention, watershed protection, tourism, recreation, mushroom-gathering, etc. and compare this to the economic value of the cut-over areas.

Graphics – Comment suggests the use ofgraphics to display the following 19 items: 1) Past logging sites; 2) Timberland Suitability; 3) Old Growth; 4) Interior Forest; 5) Existing Roads; 6) Roads Density; 7) Vegetation Type; 8) Soil Type; 9) Topographical Information (% Slope); 10) Unstable or potential Mass-wasting Slopes; 11) Management Area Prescriptions; 12) Cliffs, Waterfalls, Talus fields, etc.; 13) Snag Density; 14) Wetlands and Riparian Areas; 15) Trails; 16) Visual Quality Objectives; 17) Property Ownership; 18) Right-of-Ways, Powerlines, etc.; and 19) Senitive Areas (i.e. wilderness, natural areas, etc.).

Various – Comments identifies articles that alleges the Forest Service does not act in the public's interest and the Forest Service is biased in favor or logging. Comment also identifies the Inspector Generals Report, "Timber Sale Environmental Analysis Requirements" as needing consideration.

Indiana Bat (summarization) – Comment requests consideration of the Indian Bat and all research on this Endangered Species per summer, fall, and winter habitat, summer roosting and foraging habitat, roost tree loyalty and location, mortality of roosting bats during timber sale actions, increasing food competition with and predation of Indian bats in openings, the prescence of hibernacula, and the possibility of logging "taking" Indian bats.

Tallying issues contained within all comments from scoping and 30-day period resulted in the following:

1. Old growth should be designated in blocks versus dispersed stands and treatment stands should maintain large trees characteristic of old growth.
2. Sediment, both fine and coarse sediment, produced by proposed actions (particularly roads), may enter losing streams in spring recharge areas (NE Corner Project area is within the Big Spring recharge area).
3. The desire to prescribe burn approximately 660 acres to create pine woodland will, over time, reduce the ability of these acres to produce timber products in a Management Area (MA) that emphasizes economically efficient pine timber products production.

Alternative Development

Developed Alternatives

Alternatives to the proposed action must address at least one of the significant issues described above and must meet the purpose and need as stated. A No Action alternative must be included as one of the alternatives. The ID Team felt that one other action alternative to the proposed action should be analyzed: This additional action alternative would implement vegetation management activities similar to but with some changes from the Proposed Action and without the 658 acres of prescribed burning. The ID Team feels that these alternatives, along with the No Action alternative, represent a full and fair consideration of issues identified in scoping and the full and fair consideration of substantive comments received during the 30-Day Comment Period on the Proposed Action per 36 CFR 215 regulations of June 4, 2003. The alternatives identified for analysis by the ID team and approved by the Responsible Official are:

Alternative 1 (No Action):
In response to Issues 1, 3
Alternative 2:
In response to Issues 1, 2
Alternative 3:
In response to Issues 1, 2, 3

Description of All Alternatives Considered

Alternatives Dropped From Consideration

An Alternative to Change the Management Prescription of the Area

An alternative to manage this area for forest interior species, by changing its management prescription was considered. The ID team felt that the Management Prescription emphases are best determined at the Forest Plan level and significant reasons for changing them need to be presented (e.g. new scientific information, new technology, new information on demands and needs, and the results of ongoing monitoring and evaluation efforts). In our judgment, the commenter provided no information that indicated a reasonable or compelling need to fully evaluate an alternative to manage for forest interior species or to change the management prescription to emphasize forest interior species. The Doniphan/Eleven Point District has several areas that already provide high quality forest interior conditions over large contiguous acres. The 17,365 acre Irish Wilderness and adjacent 8.1 area, the 4098 acre Greer Spring Special Management Area and the 8021 acre Eleven Point National Scenic River corridor provide a connected block of 29,484 acres or 9% of the district in lands where timber harvesting will not occur. In addition to this large block, there are two 6.1 Management Areas (3079 acres and 3265 acres) which are adjacent to the Ozark National Scenic Riverways. Neither of these two areas has timber harvest planned in the near future. With almost 36,000 acres (11% of the district) of high quality forest interior conditions available on the district, we do not feel it necessary to change management prescriptions in other areas. The NE Corner Project area is about 97% forested now and would remain at that level in any alternative. Therefore, it also would provide smaller areas of old growth and forest interior conditions. In addition, the No Action alternative would in effect create forest interior conditions through time and the effects of this alternative on forest interior species are assessed in the EA.

Reduce Even-Aged Management (Using Only in Exceptional Circumstances)

An alternative with even-aged management minimized, and used only in exceptional circumstances was considered. The ID team felt that the appropriateness of the use of silvicultural systems are best determined at the Forest Plan level and significant reasons for eliminating their use need to be presented (e.g. new scientific information, new technology, new information on demands and needs, and the results of ongoing monitoring and evaluation efforts). In our judgment, the commenter provided no information that indicated a reasonable or compelling need to fully evaluate an alternative that eliminates even-aged management. In each action, alternative even-age management is used where it is deemed the best management practice for the site. Uneven-age management is used in the action alternatives where it is optimal and will yield the desired results. It is excluded from areas where it is clear from experience, or research, that it will not work. Since this alternative suggestion is incorporated in part in all the action alternatives, it will not be carried further in the analysis.

A "No Logging" Alternative

A "No Logging" alternative was considered, but eliminated from detailed consideration for the following reasons: Providing no logging on the Mark Twain National Forest was addressed during the development of the Forest Plan. During that analysis, the no logging alternative was eliminated because it was not responsive to the public's issues or the management concerns that had been identified. Following an analysis of a wide range of alternatives, the Forest Plan was approved with goals and management direction that utilized logging as a means to achieve healthy forests and a range of vegetative age classes. As described in the Forest Plan, this range of age classes will provide for certain wildlife habitat objectives for the forest to be met. Since the approval of the Forest Plan, we have moved forward in its implementation, utilizing timber harvest as a means to move toward the desired future condition described in the plan and described in the purpose and need of this EA.

The No Action alternative is an alternative that does not include logging. The effects of not logging any timber in the project area are described in the EA. In addition, non-logging activities are proposed in all the alternatives. Alternatives 2 & 3 all include projects to maintain roads (enhancing opportunities for dispersed recreation), provide opportunities for firewood gathering (to heat residents' homes), reduce hazardous fuel accumulation in high probability wildfire areas, improve growing conditions for young oak-hickory-pine forests and designate old growth where no logging would occur. Projects which do not include logging are frequently incorporated in NEPA documentation that can be categorically excluded from documentation in an EA or EIS... projects such as these in the recent past include trail reconstruction & maintenance and wildlife habitat improvement.

Fully Develop and Consider Single Tree Selection (Not Group Selection) for Uneven-aged Management

The decision to use group selection cutting for uneven-age management is a Forest Plan decision and group sizes may range from 0.25 to 2 acres (page IV-37). While there is some indication that single tree selection is feasible in the Ozarks, caution is advised regarding wide spread application (Johnson, 1995), and where it has been used, its success appears to be linked to the presence of numerous small diameter white oaks. Johnson (1993), in Perspectives on the Ecology and Silviculture of Oak-Dominated Forests in the Central and Eastern States, cites authors who recommend group sizes of 0.10 to 0.5 acre and Marquis (1989) who indicates larger openings be referred to as patch cuts or clearcuts if the objective is to perpetuate these as even-aged units through successive rotations. As a rule of thumb, we have been anticipating regenerating up to 15% of a stand in groups, based on an average rotation age of 100 years and a 15 year cutting cycle, realizing we may not find that amount of regeneration opportunity in every stand proposed for group selection harvest. At this time, the intent is not to carry new age classes as even-age units through successive rotations.

Regarding group selection and area regulation, Murphy, Shelton and Graney (1993), in Group Selection--Problems and Possibilities for the More Shade Intolerant Species state "Area regulation also seems to be appropriate for applications in even-aged stands that are being converted to uneven-age ones." This is exactly the situation in the Eastwood project area. "This is especially true during the early part of the conversion effort, when opening locations are easy to select. Regulation might switch to volume or structure later in the conversion period when multiple age classes exist." Right now, the Eastwood project area is composed of single-age stands and the multiple age classes needed to make singletree selection effective do not yet exist. "Much of what has been written about group selection and feasible regulation alternatives is speculative (our paper included), because of the paucity of past research. A rejection of using area regulations seems to be due to the intimate association of volume or stand structure control with singletree selection. However, this rejection does not seem to be justified, and using area control in conjunction with structure control for the residual stand appears to be a feasible alternative." The objective of using group selection in the Eastwood project area, in conjunction with improvement cutting, is to begin developing uneven-age structure in even-age stands by initiating new oak regeneration, or by releasing existing regeneration or larger recruitable trees. Group locations would occur where advance oak regeneration and/or sprout potential exist and where groups of mature or low quality trees are present and would vary in size (within the 0.25-2 acre range) depending primarily on the size of area where the above conditions exist.

One of the purposes of this management area and for proposing these projects is to create a variety of wildlife habitats within the oak-hickory forest ecosystem, including early successional stages and varying amounts of crown closure. Some of the methods to achieve this are even-aged regeneration harvests planned on a scale similar to that of naturally occurring disturbances, and application of uneven-age harvest using both group and singletree selection. The application of solely singletree harvest throughout the project area would not create the diversity of habitats that support the entire spectrum of native Missouri wildlife. Therefore, this alternative will not be analyzed further.

Alternatives To Be Evaluated In Detail

Alternative 1 (No Action).

In the No Action alternative, the Forest Service would not implement any proposed action or alternative in the NE Corner proposal. The option for future management in this area would not be foreclosed. It also provides a baseline for comparison between the action alternatives.

This alternative responds to those that request more old growth allocation by allowing the project area to move towards an old growth condition due to the lack of vegetative management. It does not respond to those that would like to see fewer acres designated as old growth in the project area.

This alternative responds to two issues, which are amount and distribution of old growth forest and amount and distribution of even-aged regeneration harvest, particularly clearcutting. The stands designated for clearcutting, shelterwood seed cutting, seed tree seed cutting, and overstory removal in the proposed action will not be harvested. Vegetative management will not take place.

There would be no open/semi-open habitat created or maintained with this alternative, but mast-producing acres would increase slightly through time as oak and oak-pine stands matured. Also as stands matured, they would eventually become old growth (>90 years for oak, >80 years for pine and oak-pine). In the next 20 years 1,390 acres (25%) of the project area would reach or exceed 90 years of age.

Mitigation measures beginning on page 33 contains complete descriptions of mitigations referred to in all action alternatives and meet or go beyond the Forest Plan standards and guides. These mitigation measures are numbered CR1, CR2, CR3 A1, SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11, SW12, SW13, SW14, VG1, LL1, WL1, WL2, WL 3, WL4, WL5, WL6, VS1, VS2, VS3, and VS4.

Alternative 2 – Habitat Restoration Emphasis (See Appendix D for a description of the activities)

This alternative includes:

Creation of early successional habitat through regeneration of oak/pine stands, involving:

Clearcutting on aproximately338 acres (planting of 165 acres to regenerate), **Seed Tree Seed Cut** on approximately 88 acres (planting of 22 acres to regenerate),, and **Shelterwood Seed Cut** on approximately 33 acres. These cuts would be followed up with reforestation work (site preparation for natural regeneration, except as noted).

Providing suitable conditions for regeneration of forest stands, involving:

Shelterwood preparatory cutting on approximately 57 acres to begin preparing the site for seedlings and **Site preparation cutting for natural regeneration** on approximately 314 acres of even-aged and uneven-aged regeneration harvests.

Contribute to the improvement in the overall health of forest stands and landscapes, involving:

Salvage cutting on approximately 114 acres to improve the growth of the residual stand through removal of dead and dying (still sound wood) trees with allowance for some contribution to the dead (rotted and decayed) wood component for wildlife and nutrient cycling, **Commercial thinning** on approximately 1642 acres to improve growth and health of remaining trees, **Pre-commercial thinning** on approximately 439 acres to improve growth and vigor of leave trees

Using alternative methods to achieve goals and objectives on suitable acres, involving

Un-evenaged management group selection with commercial thinning between groups on approxiamtely 396 acres, improvement (non-commercial) cutting on approximately 439 acres, with follow-up reforestation work on **approximately 44 acres of group openings** (site preparation for natural regeneration).

Providing a diversity of habitat and forest conditions, involving:

Old growth designation of approximately 709 acres, **Prescribed burning of 692 acres** to maintain or create open/semi-open pine savanna habitat conditions

Providing a safe forest transportation system at an appropriate level for management and reasonable public access:

Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; **Close approximately 13 miles** of non-system roads; **Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road** needed for management access and **Close the same 14 miles immediately** after the temporary/unclassified road has served its purpose; and **Estimate** a**pproval of an estimated 31 miles of skid trail locations** to provide consideration of this impact to the environmental analysis.

Alternative 2 represents a proposed action that has changed from the proposal contained in the Scoping Report that was distributed or made available to the public for comment on January 31, 2003. This alternative addresses the issue of the need to provide a pine woodland habitat to increase vegetative and biological diversity over approximately 660 acres within Compartments 284 and 285. Additional needs outside of this pine woodland commercial thinning/prescribed burning (See maps in Appendix A) in the remaining portions of Compartments 284 and 285, as well as Compartment 280-283 and 286-287 are based on contracted silvicultural exam (COMPEX) prescriptions and subsequent changes, deletions or additions of the or to the COMPEX prescriptions by a Certified Silviculturist. The Certified Silviculturist reviewed stand prescriptions in the field. This alternative moves the project area towards long term wildlife habitat goals by providing 1195 acres of early successional temporary forage habitat through clearcutting, shelterwood seed cutting, seed tree cutting, and uneven-aged management-group selection with improvement cutting, and 692 acres of open/semi-open woodland savanna conditions through burning. There would be 12 miles of road reconstruction work to existing developed roads.

Alternative 3 Silvicultural Emphasis (See Appendix D for a description of the activities)

Alternative 3 was developed in response to public issues regarding stand-specific changes to the proposed action. Creating blocks of old growth uninterupted by harvest stands and eliminating or mitigating some harvest proposals are the basis of this alternative. This alternative also addresses current stand-level silvicultural needs versus habitat restoration needs. This alternative also responds to a concern over the amount of burning in the Proposed Action. Alternative 3 is essentially the same as Alternative 2 with the following issue-driven changes:

<u>Compartment 282/Stand 59</u>
Proposed for commercial thinning in Alternative 2 will be changed to an old growth designated stand to complete a block of old growth.

<u>Compartment 282/Stand 52</u>
All prescribed burning will be dropped in Alternative 3, except for Stand 52. Some stands in the Big Hollow Prescribed Burn area prescribed for commercial thinning will be dropped while others will be changed to other silvicultural prescriptions, as follows:

<u>Compartment 283/Stand 66</u>
The western 2/3 of this stand will be clearcut as in Alternative 2, but the eastern 1/3 (east of the drainage) will be commercially thinned.

<u>Compartment 284</u>
Stand 26 Old growth (20 acres); Stand 27 Dropped; Stand 28 Shelterwood (41 acres); Stands 29-33 Group Selection (11 acres of openings/96 acres of commercial thinning/63 acres of non-commercial thinning); Stand 34-35 Dropped; Stand 36 commercial thinning (18 acres); Stands 37-38 (14 and 21 acres); Stand 39-40 Dropped; Stand 41 and 42 commercial thinning (13 and 8 acres); Stands 43-44 Dropped; Stand 45 Group Selection (2 acres of opening/17 acres commercial thinning/11 acres non-commercial thinning; Stand 46-47 Dropped; Stand 48 commercial thinning (11 acres); Stand 49 Shelterwood Prep. (15 acres); Stand 50 Dropped; Stand 51 no burn; Stand 52 Dropped; Stand 53-54 no burn.; Stand 56 Old growth; and Stand 57 Clearcut (14 acres).

Table #1 - Summary of Project Actions By Alternative (Total Project Area = 7414)

Clearcut Alternative 1 – No Action – 0 acres Alternative 2&3 – 338 acres	Salvage Alternative 1 – No Action – 0 acres Alternative 2 - 114 acres Alternative 3 – 149 acres
Seed Tree Cut Alternative 1 – No Action – 0 acres Alternative 2&3 – 88 acres	Commercial Thinning Alternative 1 – No Action – 0 acres Alternative 2 – 1660 acres Alternative 3 – 1262 acres
Shelterwood Seed Cut Alternative 1 – No Action – 0 acres Alternative 2 – 33 acres Alternative 3 – 73 acres	Improvement Cutting (thin between groups)[1)] Alternative 1 – No Action – 0 acres Alternative 2 – 389 acres Alternative 3 – 586 acres
Shelterwood Prep Cut Alternative 1 – No Action – 0 acres Alternative 2 – 57 acres Alternative 3 – 89 acres	Group Selection Cutting (creating openings) Alternative 1 – No Action – 0 acres Alternative 2 – 42 acres Alternative 3 – 66 acres
1) The creation of group openings results in approximately 10% of the total area designated for management under group selection in actual openings (canopy removal). Monitoring has indicated this percentage can be as low as 7% in specific stands for specific conditions.	

Site Prep & TSI Actions	Other Habitat Conditions Provided
Site Prep for Natural Rgeneration Alternative 1 – No Action – 0 acres Alternative 2 – 314 acres Alternative 3 – 372 acres	Maintain Savanna Conditions with Rx burning Alternative 1 – No Action – 0 acres Alternative 2 – 692 acres Alternative 3 – 34 acres
Planting and Release Alternative 1 – No Action – 0 acres Alternative 2&3 – 189 acres	Old Growth Designation Alternative 1 – No Action – 0 acres Alternative 2 – 157 acres of new designation Alternative 3 – 199 acres of new designation
Precommercial Thinning TSI Alternative 1 – No Action – 0 acres Alternative 2&3 – 439 acres	

Transportation System Management Actions (miles)

Road Reconstruction/Maintenance Alternative 1 – No Action – 0 miles Alternative 2 – 12 miles/10 miles Alternative 3 – 12 miles/10 miles	Temporary Roads (constructed and closed) Alternative 1 – No Action – 0 miles Alternative 2 – 5 miles (plus use of 4 miles of unclassified road) Alternative 3 – 5 miles (plus use of 4 miles of unclassified road)
Close Non-System Roads Alternative 1 – No Action – 0 miles Alternative 2 – 14 miles Alternative 3 – 14 miles	Skid Trails Alternative 1 – No Action – 0 miles Alternative 2 – 31 miles (40 feet/acre of action) Alternative 3 – 31 miles (40 feet/acre of action)

Summary of Environmental Effects
(by resource)

OIL/WATER
Alternative 1 - (No Action)
Disturbance of soil/water resources would occur only at natural rates. Non-system roads would continue to erode at an acclerated rate if use continues.
Alternatives 2-3
No timber stands present with soil loss potential greater than Plan standards. Mitigation measures to be applied to temporary roads, landings and skid trails in all harvest units. Water, soil and riparian resources would be maintained and protected if the listed mitigation measures are applied.

AIR QUALITY
Alternative 1 - No Action
No Effect
Alternatives 2
Burning of 692 acres proposed in this alternative would have a temporary effect on local air quality. No long-lasting effects.
Alternative 3
Burning of 34 acres proposed in this alternative would have a minimal effect on local air quality. No long-lasting effects.

WILDLIFE
Alternative 1 - (No Action)
No management related changes to MIS populations nor any short-term changes in species population. Temp. forage below Plan standard and % minimum viable. Open/semi-open habitat is not within Plan standard. Old growth within Plan Standard for Mnagement Area 4.1-12.
Special habitat: No adverse impact. Long-term: NO ACTION would increase forest interior species and decrease early successional species.
Alternative 2 only
Plan standards: Temporary forage is below Plan standard but above % needed to maintain minimum viable populations.
Alternative 2
Population changes are not likely to occur, however, short-term displacement of wildlife in active harvest areas is likely to impact individuals of a species. It is in Alternative 2 that open/semi-open is within Plan standard. Meets old growth Plan standard. Special habitat: No adverse impact. Long-term: Long-term population trends are not likely to change and there is not likely to be any affect on viability of any species local or regional population.
Alternative 3
Alternative 3 is below Plan Standard for temporary forage.

VEGETATION

Alternative 1 - (No Action)

Short-term: Decrease in oak species diversity due to decline/mortality in red oak species. Little change in structural diversity. Long-term: In absence of disturbance, some loss of oak on mesic sites and relatively slower change in structural diversity. Would forego the opportunity to improve habitat for some Regional Forester's Sensitive Species (RFSS).

Alternative 2-3

Short-term: Increase structural diversity and maintain species diversity with regeneration of oak/hickory pine components and burning to maintain/develop savannas. Long-term: Maintains presence of oak on more mesic sites and more structural diversity in oak/hickory/pine components. Provides more variety in habitat availability for Regional Forester's Sensitive Species than Alt. 1.

BIODIVERSITY

Alternative 1 - No Action

Big picture/ecosystem view: Natural forces would be primary change agents. Human-caused change would result from recreation use and changes from outside the area.

Protect communities and ecosystems: All communities would continue to exist, although amount of each might fluctuate over time. Eventually most of area in late successional habitat w/associated species.

Minimize fragmentation: Fragmentation and corresponding species and structural diversity a result of natural disturbance.

Maintain unique or sensitive environments: No effects on Irish Wilderness.

Protect genetic diversity: Genetic adaptations for early successional or savanna species relatively more difficult due to decreasing habitat.

Alternative 1-3

Big picture/ecosystem view: Highways and roads continue to exist. Natural disturbances continue to affect the project area. Fire protection would continue. Local economy would continue to rely on wood products. Outdoor recreational pursuits would continue.

Promote native species: No actions proposed in any alternative would introduce non-native species and there would be no management of native species on inappropriate sites.

Protect rare & ecologically important species: A Biological Evaluation shows no federal listed species are known to occur in the project area. The BE concluded that there would be no additional effects to federal species beyond those evaluated in the programmatic BA of 1998 and programmatic BO of 1999. There are known locations for Eastern Region Sensitive species. There are several ERSS and state endangered species for which potential habitat exists. The evaluation concluded that the projects proposed under any alternative would have no effect on ERSS species and that habitat would be maintained for state-endangered species.

Maintain unique or sensitive environments: Special communities are addressed under Protect Communities and Ecosystems.

Maintain or mimic natural ecosystem processes and naturally occuring structural diversity: Alt. 1 would come the closest to allowing natural processes to operate. Prescribed burning under Alts. 2 would mimic the fairly frequent low intensity fires which maintained savannas and open wood conditions. In Alts.2-3, clearcut, seedtree and shelterwood seedcuts would mimic larger stand replacement events such as high intensity fire or windstorms. Commercial thinning, salvage cutting and uneven-age harvest methods would create the smaller and more numerous openings typical of most natural disturbances.

BIODIVERSITY con't

Protect genetic diversity: There would be no attempt to physically move any plant or animal species from somewhere else into the project area in any alternative.

Restore ecosystems, communities, and species: Open woods and old growth communities have been altered or reduced within historic times in this area. Alt. 1 most favors restoration of the old growth community although Alts. 2-3 also designate potential old growth. Alts. 2 provides for restoration of shortleaf pine woodland communities.

Monitor for biodiversity impacts. Acknowledge uncertainty. Be flexible: Monitoring specific to the project area would include first and third year regeneration surveys in clearcut, seedtree and seedcut areas (Alts. 2-3), monitoring conducted as part of timber sale contract administration to mitigate impacts on soil, water quality, and residual vegetation (Alts. 2-3), and informal visits to the project area to compare the results of project implementation with expectations (Alts. 2-3).

Incorporate human needs: Recreational uses would still be possible under any alternative. Alts. 2-3 would provide commercial wood products. Personal use firewood would be available under all alternatives, although this commodity would be limited under Alt. 1 with no harvest activities that would create additional fuelwood opportunities.

VISUAL

Alternative 1 - (No Action)

Least noticeable change. Most changes occur slowly. Catastrophic natural events could change visuals abruptly.

Alternative 2-3

Vegetation management activities are visually evident, however, all harvest areas meet respective VQOs of partial retention and modification. Mitigation measures to "soften" effects along some roads and property lines are applied in these alternatives.

RECREATION

Alternative 1 - No Action

Short-term: Quality of recreation opportunity remains the same.

Long-term: Recreation opportunities associated w/forest interior environment increase; those associated with early successional environment decrease.

Alternative 1-3

Roaded natural recreation experience maintained in all alternatives.

Alternative 2-3

Short-term: Harvesting causes some reduction in the quality of the recreation experience. Visual impact are virtually the same with Clearcut acres and Seed Tree acres that are the same in Alternative 2-3. Shelterwood acres increase by 40 acres in Alternative 3 from Alternative 2.

Long-term: Recreation opportunities associated with early successional and savanna environments would increase; those associated with forest interior environment would decrease. Non-system road closures would be viewed positively by some and negatively by others. Removal of non-system roads from the transportation system also viewed positively/negatively.

ECONOMICS

Alternative 1 - No Action

No harvesting would shift demand to other National Forests or private land.

Alternative 2-3

Provides the raw material to local sawmills to create commercial forest products and maintain employment for local employees.

HERITAGE RESOURCES
Alternative 1 - No Action
No Impact
Alternative 2-3
Surveys would be conducted in all proposed harvest and burn areas prior to project implementation to determine the presence/absence of historic/prehistoric sites, and sites would be protected during project implementation.

TRANSPORTATION SYSTEM
Alternative 1 - No Action
No road closure or reconstruction would occur this plan period
Alternative 2
Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; Close approximately 13 miles of non-system roads; Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road needed for management access and Close the same 14 miles immediately after the temporary/unclassified road has served its purpose; and Estimate approval of an estimated 31 miles of skid trail locations to provide consideration of this impact to the environmental analysis.
Alternative 3
Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; Close approximately 13 miles of non-system roads; Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road needed for management access and Close the same 14 miles immediately after the temporary/unclassified road has served its purpose; and Estimate approval of an estimated 31 miles of skid trail locations to provide consideration of this impact to the environmental analysis.
Alternative 2-3
Close 14 miles of non-system road.

Table #2 - Alternative Comparison With Forest Plan Standards and Guides
(PA = Project Area / MA = Management Area)

0-9 age class (acres / percent)	PA Alt.1	MA	PA Alt.2	MA	PA Alt.3	MA
Existing	0 / 0	97 / 1	0 / 0	97 / 1	0 / 0	97 / 1
Proposed	0 / 0	0 / 0	501 / 6.8	501 / 5.3	565 / 7.6	565 / 5.9
Total	0 / 0	97 /1	501 / 6.8	598 / 6.3	565 / 7.6	662 / 6.9
Forest Plan S&G: 8-15%	0%	1%	6.8%	6.3%	7.6%	6.9%
Open/Semi-Open (savanna/pond habitat)	PA Alt.1	MA	PA Alt.2	MA	PA Alt.3	MA
Existing	175 / 2.4	210 / 2.2	175 / 2.3	210 / 2.2	175 / 2.4	210 / 2.2
Proposed	0 / 0	0 / 0	132 / 1.8	132 / 1.4	0 / 0	0 / 0
Total	175 /2.4	210 / 2.2	307 / 4.1	342 / 3.6	175 / 2.4	210 / 2.2
Forest Plan S&G: 4-10%	2.4%	2.2%	4.1%	3.6%	2.4%	2.2%
Designated Old Growth	PA Alt.1	MA	PA Alt.2	MA	PA Alt.3	MA
Existing	552 / 7.4	930 / 9.8	552 / 7.5	930 / 9.8	552 / 7.4	930 / 9.8
Proposed	0 / 0	0 / 0	157 / 2.1	157 / 1.6	199 / 2.7	199 / 2.1
Total	552 / 0	930 / 9.8	709 / 9.6	1087 / 11.4	751 / 10.1	1129 / 11.9
Forest Plan S&G: 8-10%	7.4%	9.8%	9.6%	11.4%	10.1%	11.9%

Table #3 - Alternative Response: to Issues

Needs, Issues, Concerns, Opportunities	How Addressed in Alternatives		
	Alt.1	Alt.2	Alt.3
Sediment from roads	No road closure or reconst. this plan period	Mitigations, pp. .29-30	Mitigations, pp. .29-30
Roads crossing streams	No new streams crossings.	Mitigations, pp. .29-30	Mitigations, pp. .29-30
Maintain contiguous blocks of old growth	No old growth designation.	Old Growth in dispersed or small blocks.	Change C282/S59 to Old Growth
Keep old growth values in C283/S56,36	No old growth designation.	Mitigations, p.33 S56 – Clearcut S36 – Shelterwood	Mitigations, p. 33 S56 – Clearcut S36 – Shelterwood
Maintain old growth characteristics in C284/S28	No old growth designation.	Mitigations, p.33 S28 – Commercial Thin	Mitigations, p. 33 S28 – Shelterwood
Maintain aesthetics along US 60 and other travelways	No proposed actions implemented	Apply mitigations on pp. 33-34.	Apply mitigations on pp. 33-34.
Choose less aggressive cut in C283/S66 not being regenerated	No cuts implemented	C283/S66 proposed for clearcut of west 2/3, east 1/3 for comm.thin.	C283/S66 proposed for clearcut of west 2/3, east 1/3 for comm.thin.

Mitigation Measures

Soil and Water (SW):

SW1 - Temporary road and main skid trails would be located on the ground by Forest Service personnel prior to harvest operations, avoiding layouts that concentrate runoff into draws, ephemeral drainages, sinkholes or watercourses.

SW2 - Proper grade and water control structures would be constructed and maintained on skid trails. Specifications that are indicated in the Missouri Department of Conservation's "Missouri Watershed Protection Practice" would be followed. Roads would not drain directly onto skid trails or into stream channels.

SW3 - When logging is complete additional slash would be pulled onto skid trails.

SW4 - Forest Service would suspend skidding during wet periods, when excessive rutting and churning of the soil begins or when runoff from skid trails is turbid and no longer infiltrates within a short distance from the skid trail.

SW5 - Prescribed burn units should have as little mechanical disturbance to the soil before and just after burning as possible. Equipment would not use stream channels as "roads." Where stream crossing is unavoidable it would be done in locations that would create the least impact on stream banks and beds.

SW6 - Fire lines created with dozers would not be placed in riparian areas, fens, wetlands, or other sensitive habitats.

SW7 - All fire lines would be seeded with a cover crop suited to area objectives and would be fertilized, if necessary, with standard fertilizer immediately after construction or as soon afterwards as to allow the best chance of germination. Water bars would be constructed in accordance with the Missouri Department of Conservation's "Missouri Watershed Protection Practice" to minimize water movement along fire lines.

SW8 - Trees anchoring stream banks of any distinct channel would not be cut unless they are species that is known to "sprout" from a cut tree's roots, even if the stream does not require a buffer zone. This includes channels that are the result of road drainage ditches.

SW9 - Reconstructed and temporary road constructions, which have potential to cause severe erosion, would have additional water protection mitigations as follows,: Temporary roads that cross drainages would be closed as soon after the harvest or treatment as possible. All crossings would be constructed at right angles to the channel at locations chosen to have the least impact as possible on the stream channel and banks. Slash filter would be placed uphill from any drainage and used as filter at the outside of the water-bar nearest the drainage. If the crossing location is soft, it would be reinforced with aggregate.

SW10 - No mechanical disturbance of the soil would occur on slopes greater than 35%.

SW11 - Stands with soils that have perched water tables would have little to no mechanical disturbance to wet soil.

SW 12 - A 50-foot no-cut zone will be place around all fens, seeps and springs. A buffer zone of at least 100 feet in radius would be retained in association with seeps, fens, springs, and any other special features or habitats. Skidding and decking would be prohibited within these buffer zones.

SW 13 - There will be a no cut zone of at least 50 feet from the edge of any sinkhole that currently exists within the activity area, or if one develops before the action is initiated. Strips of unburned vegetation will be maintained around sinkholes and long stream corridors to filter and control surface water flow. A buffer of 100 feet will be provided around natural sinkhole ponds. Within this buffer, there will be no commercial harvest of trees, no firewood permits, and no ground-disturbing activity. Prescribed fire would be allowed within the buffer zone.

SW 14 - Log landings, major skid trails, and other areas where mineral soil is exposed would be naturally re-vegetated. If not successful after one growing season, artificial seeding and fertilizing would be done for cover crop only. No non-native species would be seeded to provide permanent vegetation.

Heritage Resources (HR) Mitigations

Following are general descriptions of the mitigation measures that are applicable to the sites and activities in the NE Corner Project Area. The first table in Attachment C provides specific mitigation measures applicable to each of the sites individually with respect to the two project alternatives.

CR1: Site Avoidance

Site avoidance is the preferred mitigation action pursuant to the Forest Plan, Section IV-30, 31 [also FSM 2361.21(2)]. Avoidance of cultural resources will be understood to require the retention of such properties in place and their protection from effects resulting from the undertaking [MOU, 2002, Section II, H (2a, 2b)]. Effects will be avoided by implementing the following specific actions:

(1) Establishing buffer zones around those sites in areas where harvest activities will take place [to include timber harvest as well as construction of skid trails, and landings]; buffer zones will be of sufficient size to ensure that the integrity of the characteristics and values which contribute to, or may potentially contribute to, the properties' significance will not be affected.

(2) Routing temporary roads away from archaeological sites.

(3) Routing road re-alignments to avoid archaeological sites.

CR2: Site Protection during Prescribed Burns

1. Firelines

(a) Those archaeological sites located along existing woods roads that may be used as fire lines will be protected by hand-clearing those sections of the road/fireline that cross the sites. Although these roads are generally cleared of combustible debris using a small dozer, those sections of roads crossing archaeological sites will be cleared using leaf blowers and leaf rakes. There will no removal of soil or disturbance below the ground surface during fireline preparation.

(b) Archaeological sites and features that may be located along proposed routes of dozer-constructed fire lines, where firelines do not now exist, would be avoided by fireline construction – by routing firelines around archaeological sites. Sites that lie along previously constructed dozer lines from past burns will be protected during future burns by hand clearing those sections of line that cross the sites, rather than re-clearing the lines using heavy equipment.

2. Burn Unit Interior

Combustible elements at potentially eligible sites in the burn unit interiors will be protected from damage during the burns by removing fuels from the feature vicinity, and, where necessary, by burning out an area around the feature prior to igniting the main burns. Burning out is accomplished by constructing a set of two hand lines, approximately 30 to 50 ft. apart, around the feature and by then burning the area between the two lines while the burn is carefully monitored. A fuel-free zone is thereby created around the combustible elements. Any combustible features that might be located in a burn unit will also be fully documented with photographs and field drawings prior to the burn. A Heritage Resources Specialist will attend the pre-burn briefings, and Forest Service personnel will accompany any non-Forest Service crews that may participate in the burn.

Those sites containing above ground, non-combustible, cultural features and exposed artifacts will be protected by removing, by hand, any concentrations of fuels that might have built up on the sites and features. Where such fuel concentrations are not present, no mitigation is required. No mitigation measures are proposed for any sites in the burn interior that do not contain combustible elements or other above ground features [as described in (a) and (b) above], because it is not expected that the burns proposed for the Northeast Corner project area would harm these sites.

3. Post-Burn Monitoring

Post-burn monitoring will be conducted at selected sites to assess the actual effects of the burns on the sites against the expected effects and to check for indirect effects at the sites following the burn. SHPO consultation will be carried out with respect to mitigation for any sites that suffer unexpected damage during the burn, or that are suffering damage from indirect effects following the burn.

CR3: Road Maintenance

Where Forest Service System Roads that are scheduled for maintenance cross archaeological sites, road work will be confined to the existing roadway and ditches.

CR4: Survey of Landings, Temporary Roads, Skid Trails, Roads to be Reconstructed, Dozer-Constructed Firelines

Not all of these areas have necessarily been surveyed for cultural resources. Some will be located in stands in which other activities are also proposed and which have been included in the cultural resources surveys completed so far. In those cases in which these activities will take place outside stands not already included in cultural resources surveys, prior to project implementation, the cultural resources surveys will be completed. Appropriate mitigation measures as noted in CR1, CR2, and CR5 will be applied prior to project implementation to protect any archaeological sites that may be located in these areas. Consultation with the Missouri SHPO will be completed prior to project implementation.

CR5: Other Mitigation Measures

If it is not feasible to completely avoid an archaeological site (CR1) and if mitigation measures outlined in CR2 and CR3 are not applicable then the following steps will be taken: (1) In consultation with the Missouri State Historic Preservation Officer (SHPO), the site(s) will be evaluated against National Register of Historic Places significance criteria (36 CFR 60.6) to determine if the site is eligible for, or appears to be eligible for, inclusion in the National Register of Historic Places. (2) In consultation with the Missouri SHPO, mitigation measures will be developed which will lessen, or minimize, the adverse effects on the site, so that a finding of No Adverse Effect results. (3) The agreed-upon mitigation measures will be implemented prior to initiation of project activities that have the potential to affect the site.

CR6: Discovery of Cultural Resources during Project Implementation

Although the cultural resources surveys completed for this project are designed to locate all archaeological sites that might be eligible for the National Register, such sites may go undetected for a variety of reasons. Pursuant to the provisions found in 36 CFR 800.13, should any previously unrecorded cultural resources be discovered during project implementation, activities that may be affecting that resource will be halted immediately; the resource will be evaluated by a professional archaeologist; and consultation will be initiated with the Missouri State Historic Preservation Officer (SHPO), as well as with the Advisory Council on Historic Preservation, if required, to determine appropriate actions for protecting the resource and for mitigating any adverse effects on the resource. Project activities will not be resumed until the resource is adequately protected and until agreed-upon mitigation measures are implemented with SHPO approval.

Section 106 Consultation

The necessary consultation with the Missouri State Historic Preservation Officer (SHPO) as outlined in the National Historic Preservation Act, (as amended, 2000) and the accompanying regulations found at 36 CFR 800, will be carried out prior to project implementation. Such consultation will offer the Missouri SHPO the opportunity to comment on the Forest's determination of National Register eligibility of the archaeological sites in the Northeast Corner project area and the Forest's determination of effect for the project actions with respect to the eligible and unevaluated sites. Price (2003), Haberl 2000, and Zaragoza (2003a, 200b3) present the documentation submitted to the Missouri SHPO as the basis for the regulatory consultation.

Wildlife Mitigations

1999 BO Reasonable and Prudent Measures

To comply with mandatory Reasonable and Prudent Measures and their associated Terms and Conditions of the 1999 Biological Opinion, the following mitigation measures will be implemented:

WL1: Even-aged harvests (clearcut, seedtree, shelterwood seedcut): Retain a minimum of 15 sq. ft. of basal area (in clearcut and seedtree harvests) and a minimum of 25 sq. ft. of basal area (in shelterwood seedcut harvests) or reserve trees grouped aor retained around large snags, large live trees, den trees and within intermittent drainages to minimize potential for windthrow and provide thermal protection of suitable Indiana bat roost trees. Leave larger, long-lived trees (white oak, post oak, pine or hickory) where opportunities exist.

Uneven-age harvests (group selection with improvement cutting) – The longer-lived trees (white oak, post oak, hickory and pine) will be featured leave trees with diameter distribution. Snags and dens from red oaks will be left, if available, to meet standards and guidelines.

WL3: In all harvest area, retain shagbark hickory, shellbark hickory and lightning struck trees >= 9" dbh. Retain, as available and to the maximum extent possible and logistically practical, any existing dead trees >= 20" dbh and any tree >= 26" dbh unless a human safety hazard. Also, retain dead or dying trees >=9" dbh with at least 10% exfoliating bark and most den/cull trees.

WL5: If bald eagle night roosts are discovered at any time during the course of activities described in this EA, they will be protected by designating a protective buffer around the roost per the Forest Plan.

WL6: If Indiana bat maternity or summer male roosts are discovered at any time during the course of activities described in this EA, they will be protected from disturbance and the FWS will be notified immediately.

Visual Quality Mitigations

In order to reduce potential negative impacts to the view, the mitigating measure VS1 would be used for the following areas immediately adjacent to the travelway and for the near foreground seen area where affected:

Road:	**Affected Area**
US Hwy 60	Compartment 280, Stands 3,8, & a small portion of 23

VS1- Slash adjacent to travelways where timber harvest activity is occurring would be reduced to lie within 36" of the ground within the near seen area up to a maximum distance of 300' in the Variety Class-B, Sensitivity Level 1 and 48" in the Variety Class-B adjacent to Sensitivity Level 3 roads.

"In areas having a Visual Quality Objective of Retention and Partial Retention, the negative visual impacts will be mitigated concurrently with or immediately after each phase or activity. Mitigating measures will be completed for each cutting unit or project area before beginning activities in the next sequential block or project area in the same corridor/viewshed.

The total lapsed time from initiation of activities to completion of obligations specified by a contract or a project prescription shall not exceed one year for any single cutting unit or project area. Emphasis will be placed on completing all work within these areas in a systematic manner within the shortest practical time." (page IV-31 Forest Plan).

VS2-Harvest edges would be feathered away from the property line where the private land is open, not forested.

VS3-All harvest areas would be laid out on the ground in a manner that will reflect natural lines and be visually subordinate to the characteristic landscape.

Under Alternative 1, the No Action alternative, there would continue to be of open woods due to low natural soil fertility, natural disturbance (windstorm, insect & disease, etc.) or wildfire. Existing roads would also remain in the area.

Under Alternatives 2 & 3 the proposed timber management would develop or perpetuate open woods conditions in many parts of the project area. Although individual plants (if they exist in the area) might be adversely affected by the burning or harvest (depending on the timing of the activity), habitat would continue to be available for these species. Burning would be done in such a way to encourage growth of native herbaceous plants, including the plants on the RFSS list if they occur on any of the areas. There are many dwellings and outbuildings on the private land and farm practices. It is hard to predict what changes will be made to vegetation on private land in the future.

In Alternative 1, the proportion of mature and old growth forest would increase over time. A large amount of dead/down material would be provided. There would be a variety of vegetation within small openings created by natural tree mortality. Private lands would provide open habitat in the form of grazed fescue pastures.

Live and dying trees and some ground vegetation would be cut or damaged on the harvest areas in Alternatives 2 & 3 and a larger area in alternative 2 would show burned area until spring greenup. However, grasses, forbs, and shrubby vegetation would resprout and recover quickly to cover the ground area. This alternative would not decrease the opportunity for oak/hickory or pine regeneration, nor would it preclude Uneven-aged management in the stands proposed for thinning. Private lands would provide open habitat in the form of grazed fescue pastures.

For All Alternatives

All options will follow the standards and guides set forth in the Land and Resource Management Plan. There will be no long term negative impacts on any of the recreation opportunities for this area. In fact, over time, this activity will improve the quality and quantity for most dispersed activities such as hunting, wildflower and wildlife viewing and the uses at dispersed sites.

It is important to consider the overall end result desired while at the same time maintaining the current Forest Plan direction.

Prescribed burning would cause a temporary decrease in attractiveness while the area is black. Immediately after prescribed burning, the ground in the prescribed burn area would appear blackened and black fire scars would be visible on the trunks of some of the trees. If done in the spring, within 2-3 weeks new vegetation would begin growing and reduce the black appearance of the burn units. Because the burn is planned to encourage understory herbaceous plants and discourage woody species, the long-term effect will make the area more open to view.

The continued presence of open areas with a carpet of native grasses & wildflowers along the roadsides will provide a break from the wooded corridor. Where management units adjoin private properties that are open fields, the edges will be feathered into the stand. The cut areas will be laid out on the ground in a manner that will reflect natural lines and be visually subordinate to the characteristic landscape.

Under all the alternatives, there would continue to be open woods due to natural low soil fertility, natural disturbance (windstorm, insect & disease, etc.) or wildfire. Most existing roads would continue to be maintained.

ENVIRONMENTAL EFFECTS

This section presents the environmental effects of the proposed action and the alternatives. It considers direct, indirect, and cumulative effects, and evaluates these effects as they relate to biological, physical, social and economic factors. The effects of the actions proposed are tiered to the analysis in the Forest Plan FEIS. The site-specific environmental effects of the proposed action are disclosed in the remainder of this section. This chapter is organized by the alternatives and their effects on resources identified in the previous chapter. The purpose is to disclose the direct, indirect and cumulative environmental consequences so the Deciding Officer can make an informed decision.

Physical Factors

WATER QUALITY

Watershed Description - Existing Condition

The Project Area (7414 acres) lies within the Pike Creek watershed (11-digit hydrologic unit), which drains a land area of approximately 140 square miles. The Pike Creek watershed makes up approximately 7% of the Current River watershed (8-digit hydrologic unit) which lies within the Salem Plateau Subdivision of the Ozark Plateau Physiographic Region. Sycamore Creek (4^{th} order stream) and Pike Creek (5^{th} order stream) are the two major drainages in the NE Corner Project area. Both Sycamore and Pike Creek are intermittent, seasonally dry, warmwater, with 7-day, 2-year low flow known to be less than 1 cfs, and losing (MTNF, AECS). Sycamore Creek flows into Pike Creek and Pike Creek flows into the Current River.

Both Pike Creek and Sycamore Creek are designated as losing in Table J Rules of Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality. Pike and Sycamore creeks are known to lose water and dye traces indicate this ground water travels outside the Project area to re-appears near Plum Springs, Mill Creek Spring and Big Springs (Figure Ge02 - Current River Watershed, Ground Water Transport).

The NE Corner Analysis area lies in Shannon County in the central portion of the regional Current River watershed (USGS watershed number 11010008) of the White River Basin. The project area and additional compartments (288 and 300) in Management Area 1.4-2 are drained by Sycamore and Pike Creeks. All the drainages are classified as losing streams by the Mark Twain National Forest (MTNF) Aquatic Ecological Classification System (AECS). These losing streams are believed to be a part of the Big Spring recharge area (Aley 1975). A losing stream is a stream that distributes 30% or more of its flow through natural processes, such as through permeable subsoil and/or cavernous bedrock, into groundwater.

The lower end of the NE Corner project area (Compartments 280 and 281) south of Pike Creek are in private ownership for a large portion of these compartments. The majority of the private land is in fields and timber. All other streams are intermittent in the project area. There are no wetlands. A riparian area as defined in the MTNF Forest Plan p. IV-53 is found in the perennial portion of the stream. Small floodplains as indicated by Midco soils are present (See Midco soils, Landscape Location, Soil Characteristics matrix, page 45).

A dendritic stream pattern which is common in areas of relatively uniform geological structure, bisects the Ordovician age (Canadian Series) limestones, dolomites and sandstones. Eleven ecological land types (ELTs) are found in the NE Corner Project area as listed below.

Designated Uses

Both Pike Creek (from T27N,1W,S34 to T27N,R3W,S27) and Sycamore Creek (from mouth to T27N,RW,S15) are designated for livestock and wildlife watering and protection of warm water aquatic life and human health-fish consumption. Both Pike Creek and Sycamore Creek meet established criteria as defined in Table A of the Rules of the Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality for those beneficial uses (MDNR 1999a).

There are no streams within the Current River Watershed (which includes the Pike Creek watershed) designated for industrial use or as a drinking water supply. There are no streams within the Current River Watershed included in the 1998 303(d) list (a list of waters that do not meet their designated water quality criteria established for designated beneficial uses by MDNR).

Ground Water Quality

The Krast features within the Pike Creek watershed acts as a direct link to the ground water system and thus pose a threat to ground water quality if pollutants are allowed to enter. There are several ways in which contaminants can enter the groundwater system. These include losing streams, sinkholes, and abandoned wells.

Potential Point Source Pollution Sources

The Winona municipal waste water facility releases 175,000 gallons per day into Pike Creek. There are sand and gravel removal operations along Pike Creek. A part of Pike Creek on private land within the project area (T27N,R3W,Sec.24) has been channelized. Failure of Winona's treatment system and/or improper gravel mining techniques could have the potential to threaten water quality in the Pike Creek watershed and outside the Project area where watert re-appears near Plum Springs, Mill Creek Spring and Big Springs.

Potential Non Point Source Pollution Sources

Whereas point source pollution can usually be traced to a single discharge point; non point source pollution, such as sheet erosion of topsoil, runoff of nutrients from pastures, pesticide or fertilizer runoff from fields, is much more difficult to detect as well as remedy.

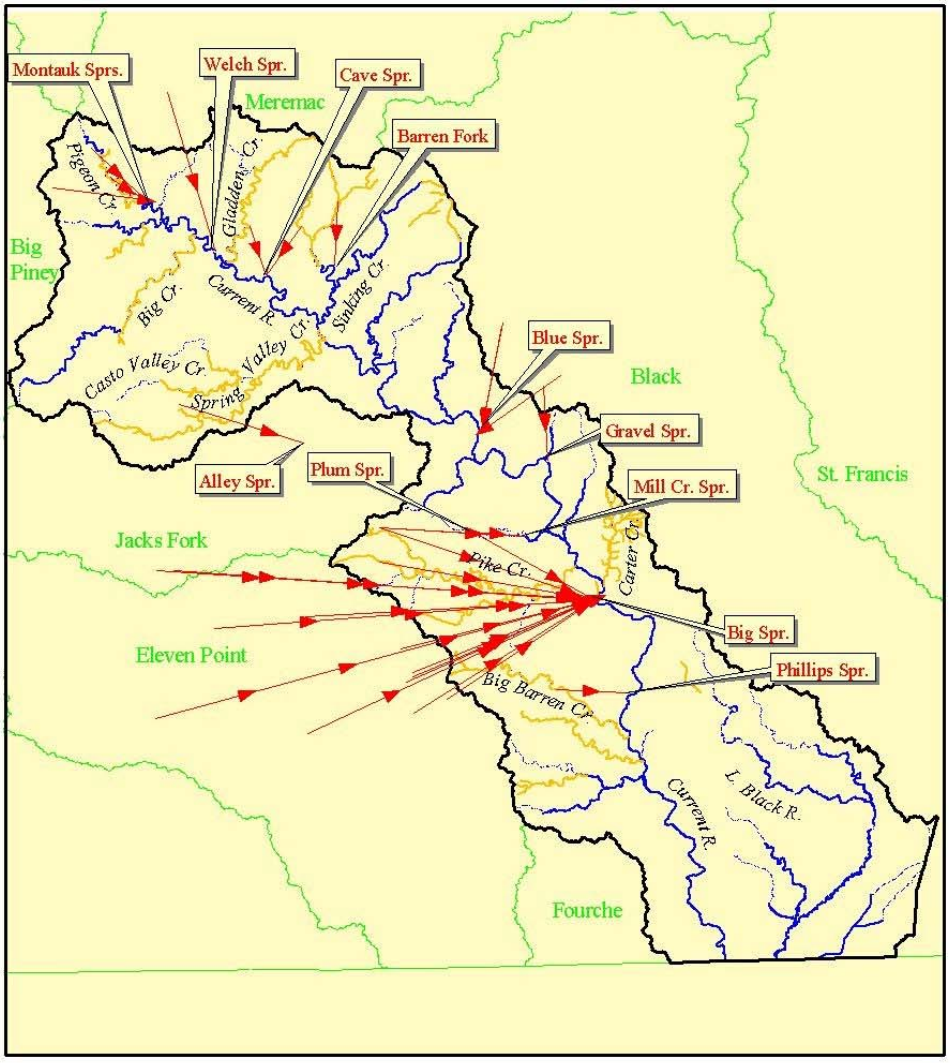
Chemical and Biological Quality of Streamflow

The USGS has an active surface discharge gaging station 07067500 at Big Springs, near Van Buren, MO. The Big Springs recharge area includes the Pike Creek watershed where the NE Corner Project is located. Water quality data for various State Standards are listed in Table 1.

Analysis of water quality from this station reveal water quality standards were met for the selected parameters during the years examined; except results for dissolved lead were inconclusive.

Figure Ge02.

Current River Watershed
Ground Water Transport



8 0 8 16 Miles

Legend

- Current River Watershed Boundary
- Dye Trace (MDNR 2000a)
- Losing Stream

N

Table #4. Selection of state standards used for comparison of values at **Station: 07067500 (Big Spring near Van Buren, Mo) Period: 1995-1999** are based on the MDNR use designation and include the following: **I** Protection of aquatic life, **II** Human Health Protection-Fish Consumption, **IV** Irrigation, **V** Livestock and Wildlife Watering, **VI** Whole-body-contact recreation.

	State Standard					Measure	Exceedence
Parameter	**I**	**II**	**IV**	**V**	**VI**	**Min-Max**	
Temperature (^{o}F)	68.0					54.7-59.72	0/29
(cool water fishery)	Max						
pH	----------6.5-9.0---------					6.8-7.8	0/29
Oxygen, dissolved (mg/L)	6.0					8.0-11.5	0/29
(cool water fishery)	Min						
Coliform, fecal					200	1-67**k**	0/28
(colonies / 100 ml)							
Hardness						113-186	
(mg/L as $CaCO_3$)							
Nitrogen, Total Ammonia	0.1-32.1[1]					<0.012-0.024	0/21
(mg/L as N)							
Phosophorus, Total[2]						<0.02-<0.05	0/24
(mg/L as P)							
Lead, Dissolved (ug/L)	9-150[3]					<1.0-<100.0	?/10
Zinc, Dissolved (ug/L)	172-337[4]					<1.0-<20.0	0/10

k Non-ideal count of colonies (too large a sample, colonies merged)

[1] Based on maximum chronic and acute standards for cold-water fishery. Levels are pH and temperature dependent. For specific criteria at varying pH and temperatures consult Table B of the Rules of the Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality.

[2] State standard for phosphorus is currently unavailable. The Environmental Protection Agency currently recommends a maximum of 0.1mg/L for rivers.

[3] Based on maximum chronic and acute standards for all waters. Levels are hardness dependent. For specific criteria at varying hardness consult Table A of the Rules of the Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality.

[4] Based on maximum chronic and acute standards for cold water fishery. Levels are hardness dependent. For specific criteria at varying hardness consult Table A of the Rules of the Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality.

DIRECT AND INDIRECT EFFECTS ON WATER QUALITY

Direct and Indirect Effects:

Alternative 1: No Action

There is no new management activities proposed; therefore, there would be no changes to water quality in the project areas, provided all other things remained constant.

Alternative 2 - Proposed Action - Habitat Resotration Emphasis

This alternative moves the project area towards long term wildlife habitat goals by providing 501 acres of early successional temporary forage habitat through clearcutting, shelterwood seed cutting, seed tree cutting, and uneven-aged management-group selection cutting, and 34 acres of open land habitat and 658 acres of pine woodland conditions through burning. Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; Close approximately 13 miles of non-system roads; Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road needed for management access and Close the same 14 miles immediately after the temporary/unclassified road has served its purpose; and Designate an estimated 31 miles of skid trail locations to provide consideration of this impact to the environmental analysis.

Non-Point source contaminants of silvicultural activities as proposed in this alternative is not significant enough to have an adverse effect on water quality, so long as "Best Management Practices" (BMP) are implemented in accordance with Forest Plan standard and guides. Non-Point source contaminants of forestry activities without BMP, such as improper construction of logging roads and skid trails, would undoubtedly contribute to the sediment load of Plum Springs, Mill Creek Spring and Big Spring. Nearly 90 percent of the erosion from timber harvesting can be traced to the logging road system. Of primary concern is how roads accelerates the delivery of sediment to the ground water system. Harvest areas are scattered throughout the project area and harvest activities with accompanying haul roads would occur over a 2-4 year period. This would reduce the amount of road system open in any given year, reducing runoff to only those roads being used at that time. Use of BMP in constructing and maintaining new roads would help reduce erosion from timber harvesting. Also, maintenance of FS roads and closure of roads would reduce sediment loads. Non-Point source contaminants from road construction activities as proposed in this alternative is not significant enough to have an adverse effect on water quality, so long as soil and water mitigation measure are implemented.

The proposed prescribed burned, viewed at the right scale of time and space, would not have a negative impact on water quality. A low intensity, landscape prescribed burn is by nature extremely patchy. The local effect of a given prescribed burn on losing streams varies depending on the intensity of the fire, which is directly related to the time of the year the burn takes place. Of primary concern is how the fire accelerates the delivery of sediment to the ground water system. The intensity of a wildfire during the high resource damage period (April 10 – October 10) can have substantial and seemingly negative effects on streams by exposing mineral soil to sheet erosion. A prescribed burn during the high resource damage period could have negative effects by increasing the amount of sediment to the ground water system. On the other hand, a patchy burned landscape, burned outside the high resource damage period (October 11 – April 9), would result in a low intensity fire, would not burn down to mineral soil and would not contribute to the sediment load of Plum Springs, Mill Creek Spring and Big Spring.

Alternative 3 – Silvicultural Need Emphasis

Alternative 3 has similar acreage to be managed as does Alternative 2, similar amount of road construction, maintenance, and closures. This is essentially the same as Alternative 2 with the following change which responds to a concern over the amount of burning in the Proposed Action. The 658-acre prescribe burn is dropped in this alternative; however a 34-acre open land burn in C-282, stands 52 and 53 remains a part of this alternative.

As in Alternative 2, the primary concern is how roads accelerated the delivery of sediment to the ground water system. In this alternative, fewer acres are harvested, thus the need for fewer roads. Non-Point source contaminants from road construction activities are not significant enough to have an adverse effect on water quality, so long as BMP and S&W mitigation measure are implemented.

The proposed 658-acre landscape prescribed burned is omitted in this alternative; however, the 34-acre open land burn remains a part of this alternative. Of primary concern is how the fire accelerates the delivery of sediment to the ground water system. All prescribe burn concerns expressed in Alternative 2 would apply for this alternative.

Cumulative Effects

The area considered for cumulative effects is Pike Creek, Sycamore Creek, Plum Springs, Mill Creek Spring and Big Springs. The time period considered for cumulative effects is the next 10 years.

Public lands total 7414 acres (69 %) of the Project Area. Within the Project Area, there exist along Pike Creek a ¼-mile reach which boarders National Forest lands. Sycamore Creek flows into Pike Creek and except for a 2 mile reach in the upper end, near Highway 19, the remaining 4+ miles of Sycamore Creek is boarded by private lands. Therefore, during the next decade, private landowners will determine land uses on 3281 acres (31%) of the Project Area. Current land uses on private ownerships include homes, farms, forest, and small businesses. Private lands are a mixture of open pastures, developed areas, and some forest. There appears to be very few trees along Pike Creek; perhaps because it is dry for most of the year. Past trends on private land are toward an increase in fescue pastures and developed areas. If this trend continues, it is likely that there will be less forest on private ownerships at the end of this decade, and more open-land or developed land. Water quality will depend in large part on how non-federal lands are managed, as all streams within the project area are defined as “losing”.

Alternative 1: No Action

There is no new Forest Service management activities proposed in Alternative 1; therefore, there would be no changes to water quality associated with Pike Creek, Sycamore Creek, Plum Springs, Mill Creek Spring and Big Springs, which would impair MDNR designated uses; provided all other things remained constant.

Alternative 2 - Proposed Action – Habitat Restoration Emphasis

This alternative moves the project area towards long term wildlife habitat goals by providing 501 acres of early successional temporary forage habitat through clearcutting, shelterwood seed cutting, seed tree cutting, and uneven-aged management-group selection cutting, and 34 acres of open land habitat and 658 acres of pine woodland conditions through burning. There would be 12 miles of road reconstruction work to existing developed roads. Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; Close approximately 13 miles of non-system roads; Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road needed for management access and Close the same 14 miles immediately after the temporary/unclassified road has served its purpose; and Designate an estimated 31 miles of skid trail locations to provide consideration of this impact to the environmental analysis.

Management activities associated with Alternatives 2 would cause some sediment movement during precipitation events. Adherence to FP S&Gs and site-specific mitigation measures would result in no appreciable changes to water quality associated with Pike Creek, Sycamore Creek, Plum Springs, Mill Creek Spring and Big Springs, which would impair MDNR designated uses; provided all other things remained constant. National Forest lands will remain forested for the next 10 years; therefore, water quality associated with the MTNF should meet or exceed MDNR designated uses.

Alternative 3 – Silvicultural Need Emphasis

Alternative 3 has similar acreage to be managed as does Alternative 2, similar amount of road construction, maintenance, and closures. This is essentially the same as Alternative 2 with the following change which responds to a concern over the amount of burning in the Proposed Action. The 658-acre prescribe burn is dropped in this alternative; however a 34-acre open land burn in C-282, stands 52 and 53 remains a part of this alternative.

Management activities associated with Alternatives 3 would cause some sediment movement during precipitation events. Adherence to FP S&Gs and site-specific mitigation measures would result in no appreciable changes to the surface and subsurface water quality. National Forest lands will remain forested for the next 10 years; therefore, water quality associated with the MTNF should meet or exceed MDNR designated uses.

SOILS

Existing Condition of Soil - Description of Affected Environment (More detailed discussions are in Appendix D, under "Soil Analysis)

The project areas lie within the "Southern Forests Subregion", Mark Twain Ecological Land Classification Terrestrial Subsystem (MT ELCTS). These areas lie beyond the southern limit of continental glaciation. Lands are basically stream dissected edges of a series of low plateaus. The result is a combination of ridges and valleys of varying degrees of expression. The "Ozark Province", MT ELCTS, constitutes this dissected upland. Cherty, droughty soils are a conspicuous feature of the Ozark Landscape. Within the Ozark Province is the "Salem Plateau Region". Much of this land is rough, steep, and forested with oak and pine. These projects are within the "Upper Ozark Subsection", MT ELCTS, which has soils whose derivations are given below.

Ecoregions of Missouri (Nigh and Schroeder 2002) place the project area in the Current River Oak-Pine Woodland Dissected Plain LTA of the Ozark Highlands Section. It consists of a moderately dissected upland plain associated primarily with the Roubidoux geologic formation. Karsts and sinkholes occur in several areas in the Eleven Point area. Slopes are generally gentle to moderate with increasing slopes towards river margins. The soils of the area are typically very deep, well-drained mineral soils, which have formed from material weathered in place, in loess, in residuum or in colluvium from the local sandstone and dolomite bedrock.

There are thirteen soil types that occur on the project area for all alternatives and are described in Appendix D. Management considers the affects of proposed actions on specific soil characteristics that may or may not be affected by implementing the proposed action. Soils with a fragipan and perched water table (Captina silt loam and Wilderness very gravelly silt loam) fit this category and are of primary management concern. These soils are often mapped in associations with soils which may or may not have either a fragipan and high water tables but are with these other soils on the landscape that mapping each separately would have proved impractical. Other soil types are located on stream terraces, floodplains, and some footslopes. Due to their location, these areas may experience frequent, brief flooding during the winter and early spring months.

The soil mapping units on these areas are Alluvial land, Ashton silt loam, Midco very cherty silt loam and Secesh loam. Clarksville very cherty silt loam, Coulstone cherty fine sandy loams, Doniphan cherty silt loam, and Poynor cherty silt loam occurs on narrow ridgetops and steep sideslopes. Due to the low available water holding capacity, shallow A horizon, and high rock content throughout the profile, the soil productivity of these soils are generally low to moderate. Macedonia silt loam occurs on broad ridges and sideslopes. Claiborne silt loam is found generally on toe slopes at the foot of slopes and at ends of ridges. Nearly every stand where the proposed actions are to be implemented has a number of soil types and some of these will have fragipans and high water tables (Captina silt loam and Wilderness cherty silt loam). Their presence does not preclude proposed actions if mitigation measures outlined in this environmental assessment and in the Forest Plan are employed. The tables in Appendix D give soil location for all stands in Compartments 280 – 288. This gives a landscape view of where soils occur.

Ecological land types (ELT) were analyzed as well. The dominant ELT's were 17 and 18, which denote south/west north/east facing slopes respectively and occur on slopes ranging from 8 – 35 a percent and above on the project areas. Other ELT's which also occur on the project areas are ELT 3 (high flood plain, low terrace, neutral aspect, 0 – 4 percent slopes), 5 & 6 (upland waterways, neutral aspect, 0 – 4 percent slopes), 11 (ridgetops, neutral aspect, 0 – 8 percent slopes), and 14 & 15 (flats, neutral aspect, 0 – 8 percent slopes). These ELT's are further identified as to characteristics and compartment/stand location in Appendix D.

The other management consideration is soils on steeper slopes. These soils are susceptible to erosion (especially on south facing aspects). When disturbed by harvesting activity, soils in these slope and aspect conditions can be subject to erosion levels in excess of standards of the Forest Plan. Most of the stands for all alternatives are on slopes between less than 15 percent. Erosion hazard for each of the soils are in the soils table in Appendix D of the EA.

Desired Future Condition for Soils

The purpose of this project is to change existing conditions to conditions that more closely resemble the desired future condition by maintaining healthy and functioning oak/hickory/pine forest communities in all their successional stages. Prior to European settlement, a mantle of loess of two to five feet blanketed southern Missouri, which was extremely productive and provided the substrate for a rich and diverse floral community above ground and an even richer and more diverse floral and faunal community below ground. (Scrivner 1966) Past land use has resulted in the erosion of most of this mantle.

The desired future condition includes restoration of soil productivity potential. It is unrealistic and impossible however to duplicate geologic processes and restore the soil to pre-settlement conditions in the foreseeable future. Soil formation is a long, time consuming process which could take hundreds to several thousand years to return to that previous condition. (Buol, Hole, McCracken, Southard 1997) However, the present project, future projects, other similar project proposals on the Forest, and the mitigation measures employed can be expected to reduce soil erosion in the short term and continue the soil formation process in the long term so soil restoration can proceed in the direction towards that desired future condition.

DIRECT AND INDIRECT EFFECTS ON SOIL

The stands that are proposed for treatment in this project cover a wide range of landscapes throughout the Doniphan Ranger District Area. The soils that would be affected by the proposed alternative are identified and characterized in Appendix D.

Many of the treatments in Alternatives 2 - 3 involve harvest of trees at different intensities. Thinning and tree harvest would leave remaining trees to occupy sites and maintain water budgets and nutrient cycles at current levels.

General Effects of Soil Erosion

Because soil is eroded off the surface horizon, erosion results in a loss of nutrients for forest productivity. (Fisher & Binkley 2000) It also results in a loss of biodiversity of thousands of species of soil micro-organisms numbering in the millions of total organisms which are lost to the site where the erosion was taking place. (Pierzynski, Sims, Vance 2000) In addition, erosion also results in a loss of carbon which was sequestered in the surface horizon. (Boyle, 2002)

Erosion Hazard is rated according to risk of erosion on forestland where normal practices are used in managing and harvesting trees. A rating of **slight** indicates soil loss is not important concern; a **moderate** rating indicates that some attention to soil loss is required; and a **severe** rating indicates that intensive treatments (such as seeding and mulching disturbed areas, water bars, etc.) or special equipment and method of operation are required to minimize erosion. Potential erosion hazard is based mainly on slope and erodability as well as on soil depth. Soils in the ELT's Number 17 and 18 are most susceptible to erosion.

There are various prediction models for soil erosion and more specifically rill and sheet erosion. The WEPP model has recently been used to predict erosion levels from harvesting activities. Use of the specifications in this EA would reduce all these erosion levels significantly and within Forest guidelines.

Equipment Limitations are rated according to the degree to which soil characteristics restrict or prohibit tree-harvesting equipment. A rating of **slight** indicates little or no restriction on the type of equipment that can be used; a **moderate** rating indicates the use of equipment is seasonally - limited, or that modified equipment (rubber tired skidders rather than crawler-type tractors) are needed; and **severe** rating indicates that special equipment is needed or that use of such equipment is severely restricted by unfavorable soil characteristics. Steep slopes indicate a safety hazard for equipment.

Potential of Damage to Soil From Fire is rated according to the degree to which soil characteristics are reduced in productive capacity from fire. The ratings (low, moderate, high) are made on the basis of texture, amount of coarse fragments, slope, and surface soil. Most of the soils associated with this proposal have a rating of low to moderate potential.

Soil surface disturbance is one of the effects of the activities proposed. Activities associated with timber harvest, regeneration, and wildlife management in Alternatives 2 would cause some soil disturbance. Potential soil compaction, soil puddling, soil displacement and soil surface erosion, as a result of heavy equipment operation, on sites where management activities would occur. There would be little loss of landform from road reconstruction as these areas have already been disturbed. Soil surface disturbance has an impact on soil quality, maintenance, and sustainability. This disturbance would be expected to occur on or adjacent to skid trails and landings both during and after the activities take place.

The Standards and Guides of the Forest Plan are designed to minimize the amount of disturbance from management activities. Assessment of proposed activities on specific sites would determine if the degree and extent of soil disturbance would cause appreciable change in soil properties to be considered detrimental to the long-term productivity of the land. Determination of effects is based on available research, the completed soil surveys for the Mark Twain National Forest, and professional judgment. Adherence to Forest Plan (FP) Standards and Guidelines (S&G) and site-specific mitigation measures that follow would result in no appreciable changes in the inherent long-term productivity of the land.

Soil limitations for the stands in the proposed alternatives range from slight to severe. Slope percentage and depth to water table are dominant factors which impose limitations. Erosion hazards are slight to moderate in most stands although the hazard can be rated as severe when slope percentages increase. The potential of damage to soil from fire ranges from slight to moderate for most soils in most stands though the hazard can become severe on steep slopes.

Alternatives were evaluated to assess whether implementation of the proposed project would result in any detrimental or beneficial effects to the soil resource. Harvesting, prescribed burning, timber stand improvement, and wildlife projects can affect soil productivity and soil quality. Alternatives can be compared based on the relative effects of soil disturbance.

The Forest Service Internet-based interface to the Forest Service Water Erosion Prediction Potential model (FSWEPP; Elloit et al 2000) was used as part of this analysis. Climate was simulated for ten years at the Doniphan, Missouri to obtain a range of wet and dry conditions. Erosion and sedimentation predictions must be evaluated with a full understanding of the uncertainties.

"At best, any predicted runoff or erosion value, by any model, will be within only plus or minus 50 percent of the true value. Erosion rates are highly variable, and most models can only predict a single value. Replicated research has shown that observed values vary widely for identical plots, or the same plot from year to year (Elliot et al 1994; Elliot et al 1995; Tysdale et al 1999) Also, spatial variability and variability of soil properties add to the complexity of erosion prediction. " (Robichaud 1996) (Elliot et al 2000) (excerpted from Disturbed WEPP(Draft02/2000)WEPP Interface for Disturbed Forest and Range Runoff, Erosion and Sediment Delivery (William J. Elliot, David E. Hall, Dayna L. Scheele. U.S.D.A. Forest Service Rocky Mountain Research Station and San Dimas Technology and Development Center, February 2000 online from http://forest.moscowfsl.wsu.edu/fswepp/docs/distweppdoc.html.

FSWEPP provides relative versus absolute results to estimate and compare the magnitude of effects of alternatives. The analysis allows a comparison of alternatives but does not predict the effects for a specific stand. The outputs are given in tons per acre. One ton of soil loss is approximately equal in weight to a uniform depth of 0.007 inches of soil over one acre. (Troeh et al.1991).

Alternative 1: No Action Alternative

No management activities would take place associated with the proposed action. No changes in productivity of the land would occur attributable to proposed actions. Regular maintenance and use of roads would continue, as well as previously planned and existing management. In the absence of wildfire, current runoff and erosion patterns would continue with natural change. An upland erosion rate of less than one ton per acre per year is predicted by FSWEPP for stands on steep slopes in the absence of fire. Natural processes and functions would continue to occur as dead material decomposes.

Actual soil organic matter may increase with an accompanying increase in microorganisms and fungi. Since there is no harvest, no carbon would be removed from the forest. Dead and dying trees would decay with carbon released to the atmosphere. Management activities in and adjacent to the project areas already planned would be carried out.

Under this alternative, fuels will not be reduced nor will biomass be removed through silvicultural treatments including but not limited to prescribed burning. Fire suppression has resulted in increased fuel loading and possible loss of savanna and glade environments present during pre-settlement times. (Heikens 1999) Wildfires that could occur under conditions of increased fuel loading can be expected to burn at a higher intensity and over a larger area than would have occurred if fires had burned at historical fire frequencies. The probability of stand replacement wildfires could be expected to increase in the absence of fuel reduction through silvicultural treatments in this proposal. The stands in other alternatives where wildfire does not occur would maintain current runoff and erosion pattern. An upland erosion rate of less than one T/A/Y is expected for stands on steeper slopes and near water if fire is excluded. Fire exclusion would result in accumulation of hazardous amounts of fuels.

Lack of fuel reduction could result in stand replacement wildfires and increase the probability and levels of erosion and sedimentation from lands where these fires occur. FSWEPP modeling indicates that a high severity fire for conditions similar to those described above would produce a ten to fifteen fold increase in erosion (depending on slope) and a like increase in sedimentation. Predicted erosion and sediment quantities are listed in Appendix D . According to the FSWEPP model, wildfire produces many times more erosion than do prescribed burns.

Wildfire control would more likely involve bulldozer constructed firelines. Overland flow in fire lines would further erode soils and be a source of sediment. A twelve foot fire line constructed by dozer along a 4, 910 foot perimeter of the average 25 acre stand in Carter Corner (the area affected by the wildfire may well be far above 25 acres) would total approximately 1.35 acres (about 5.4 percent of a 25 acres steep stand could become an erosive fireline in the event of a wildfire). If the dozer lines are constructed on soils with fragipans, especially during periods of wet weather, the erosive potential would be increased and the some of the soil structure would be destroyed. Predicted erosion rates for various scenarios are given in the Appendix D.

Alternative 2 - Proposed Action – Habitat Restoration Emphasis

Timber Management – *Even-Aged Management* – *Regeneration Harvest*

Clear Cut

Clearcut harvesting would be done on 338 acres over the eight compartments of the project areas. Clearcutting would increase areas of soil disturbance. Some of these areas would experience soil compaction by harvesting equipment. Most of the soils are moderately to well-suited to harvesting equipment (See soil characteristics table in the Appendix D). Erosion and sedimentation could occur due to erosion from precipitation on bare ground. This would be highest on clearcut sites until the ground is revegetated, (usually one to five years after harvesting). Shelterwood, group selection, and commercial thinning would achieve crown closure a few years after harvest activity and erosion potential would decrease. Erosion and compaction would be unacceptable during periods of wet soil conditions and on soils with perched water tables, typically occurring from November to May.

Soil erosion is most likely to occur on ELT 17 & 18. 297 acres of clear cutting will occur on these ELT. Soil erosion is likely to occur on steep slopes as well. No acres of clearcutting will occur on slopes over 35 percent with 160 acres occurring on moderate slopes (15 – 34 percent). Soil compaction is most likely to occur on ELT's 15 (on flats) and 11 (ridgetops) with 30 acres of clearcutting occuring on these ELT's.

Regeneration Harvest

Seed Tree

Seed tree cutting occurs on 88 acres as a part of this alternative. The amount of bare ground after a seed tree operation can be expected to be somewhat less than for a clearcut although erosion from precipitation can take place until ground re-vegetation takes place one to five years after harvesting. Ground disturbance during the harvesting process would be similar to a clearcut operation.

ELT 18, at moderate slopes of 15 – 35 percent occurs on only 22 acres, indicating a moderate erosion potential. ELT 15, at slopes less than 15 percent, indicates conditions conducive for compaction from ground-based equipment. Actions occur on only 8 acres of ELT 15.

Regeneration Harvest

Shelterwood

Approximately 33 acres of shelterwood harvesting will be done under this alternative. The amount of bare ground after a shelterwood operation can be expected to be somewhat less than for a seed tree although erosion and ground disturbance during the harvesting operation would depend on the logger, amount of material extracted, ground based equipment employed, and the contract administration. Shelterwood would achieve crown closure a few years after harvest activity and erosion potential would decrease. Approximately 17 acres occur on ELT 17 & approximately 16 acres occur on ELT 18 but primarily occur on slopes less than 15 percent. The erosion potential is low.

Intermediate Harvest

Shelterwood Prep Cut

No ground disturbing activity is expected from the shelterwood prep cut. Materials extracted for poles or similar products should be confined to periods of dry soil conditions due to silt loams with a high compaction potential. Over time, as the foliage decomposes to organic matter and is incorporated into the litter layer and/or surface horizons, an increase in soil microorganisms and available nutrients can be expected to result.

Intermediate Harvest

Salvage

Salvage would be done over 149 acres under this proposal. The extent of ground disturbance would be proportional to the amount of material extracted and the harvesting equipment utilized. All operations would be done on ELT's 17 & 18 and on moderate slopes (15 – 35 percent). The erosion potential is moderate.

Intermediate Harvest –

Commercial Thin

Commercial thinnings are planned for 1660 acres as a part of this alternative. These acres encompass a number of soils, ELT's and slope classes.

Across the project area, 29 stands occur on soils with fragipans and perched water tables. Harvesting should be confined to periods of dry soil conditions to reduce compaction and damage to soil structure. Across the project area 35 stands occur on soils on stream terraces, floodplains, or foot slopes. Harvesting in these areas need to pay special attention to erosion control so sedimentation in nearby streams does not occur. Some areas occur on other silt loams which can occur on ridgetops and/or toe slopes. These soils like the ones above can be susceptible to compaction.

Nearly half of the commercial thinning acres occur on ELT 17 & 18, southwest and northeast facing sideslopes, which have a greater erosion potential than other ELT's. The other half of thinning acres occur on ELT's 3, 5, 6, 11, 14, & 15, which occur on relatively neutral aspects and relatively gentle slopes, and have a greater compaction potential than areas on ELT's 17 & 18.

Seventy-one percent of the commercial thinning acres occur on slopes under 15 percent, which would reduce the erosion potential. Twenty-eight percent of the acres occur on 15 – 34 percent slopes. One percent of the acres occur on 35+ percent slopes (Compartment 281, Stand No. 31) and has a high erosion potential.

After harvesting and associated activities, crown closure would typically take place within five years. Erosion potential would be expected to decrease significantly after this period.

Timber Management – ***Uneven-aged Management***

Group selection on 338 acres in this project takes place on ELT's 17 & 18 where erosion is most likely to occur. Group selection on 214 acres occur on moderate slopes (15 – 35 percent) indicating a moderate erosion potential. Group selection on 42 acres occur on ELT's 11 & 15 where soil compaction is most likely to occur.

Timber Management – ***Uneven aged management – Intermediate - Natural Regeneration***

Ground disturbing activity is expected on the 42 acres of openings. Impacts are expected to be minimal and from natural forces.

Timber Management – *Uneven aged management – Intermediate – Planting*

There is no planting proposed for group openings in any alternative.

Timber Management – *Uneven-aged management – Intermediate – PCT*

No ground disturbing activity is expected from precommercial thinning. Over time, as the foliage decomposes to organic matter and is incorporated into the litter layer and/or surface horizons, an increase in soil micro-organisms and available nutrients can be expected to result.

Wildlife Management – *Old Growth Management*

No ground disturbing activity is expected from old growth management and natural functions and processes is expected to occur.

Wildlife Management – *Open/Semi Open Land*

This treatment over 692 acres would be accomplished through prescribed burning.

The effects of prescribed burning on soil erosion and nutrient loss are related to the severity of the burn. These effects are complex and depend on a host of factors but certain generalizations seem relatively consistent. Burning has its most pronounced effect on the forest floor where carbon (C), nitrogen (N), and sulfur (S) are volatilized and calcium (Ca), magnesium (Mg), potassium (K), and phosphorus (P), and other elements are left as ash. The ash is leached by rains into the mineral soil which increases its base saturation and pH. (Alban 1977) Increased nutrient availability at higher pH's may result in positive plant responses following fire. (Van Lear and Kapeluck (1989) These coincide with results from a variety of other reviews and studies. (DeBano 1998) (Luckow, 2000a, 2000b, 2000c) (Godsey 1988) (Amelon 1991) (Schlesinger 1997) Erosion can increase as a result of prescribed fire, but WEPP model runs indicate that the erosion levels are generally within soil tolerance guidelines (set up by the NRCS and the ARS) and are much lower than erosion and sedimentation levels after a high severity stand replacement fire. Even if a wildfire occurred in areas treated with prescribed burning, these areas would experience less erosion damage after the fire, wildfires would not burn as hot, and trees may be left with a portion of their foliage. (Hayman Fire Case Study Analysis, cited within E-Forester published by SAF, February 24, 2003).

Erosion from skid trails, landings, and forest roads on ridge tops is similar to erosion from a fire line. The FSWEPP model was run using skid trails on a various slopes and soils. A fuller analysis for various scenarios is given in Appendix D. Silt loams (both skeletal and non-skeletal) and a variety of slopes were modeled. The highest probability of erosion would occur after a prescribed fire on steeper slopes within 100 feet from a stream

Roads generally contribute the greatest amount of erosion and sediment in any forest system. Reconstruction, re-conditioning, spot treating, and road closures could be expected to result in a minimal short-term erosion and sediment increase (at the time the treatments are implemented) and a long-term erosion and sediment decrease.

Erosion for this alternative are not expected to exceed Forest Plan Standards and Guides or Region 9 Soil Quality Monitoring Interim Directive No. R9RO 2509.18-2002-1 for any single activity in the proposed action or other alternatives. Many stands in all alternatives have more than one activity planned (i.e. harvesting and prescribed burning). The cumulative effect of more than one activity could result in erosion exceeding soil tolerances for the soils in these areas. Strict adherence to the Forest Plan Standards and Guides and to the mitigation measures in this E.A. will be critical to keep soil erosion and sedimentation to within Forest standards. Monitoring may be advisable to ensure that mitigations were employed and that the mitigations proved effective.

Cumulative Effects

Most of the soils in the assessment developed in loess – a loamy material formed by glaciers and transported by wind – and in residuum from cherty limestone, dolomite, and sandstone. The soils are old, stony, highly weathered and acidic, except on some broad ridges and bottomlands. (USDA Forest Service, MTNF 2001)

Loess is a loamy, wind deposited material, most of which was deposited during glacial periods. In the assessment area, the mantle of loess varied in thickness from five feet to less than two feet, the loess deposits decreasing in depth in the southern most areas of the Ozarks. Soil conditions were described as ranging from "barrens and prairies …, the soils poor and covered with grass, …" to "the soil rich with a heavy growth of trees." (Nigh 1992) (Schoolcraft 1821) In many areas in this area, up to 90 percent of this mantle has been eroded away. (Scrivner, 1966) Aside from erosion occurring from geologic and other natural processes, erosion is a function of past land use. Clear cutting of pines, which began near the turn of the century and continued through the 20's and '30's, was followed by farming, annual burning and grazing. When the timber supplies were exhausted, local people turned to farming. Those attempting to pasture the cutover lands had to contend with resprouting of hardwoods . Intensive sheep and goat grazing and fire were the primary means of controlling hardwood regrowth and restoring grass cover. Repeat fires exposed the thin Ozark soils to erosion, which robbed the hillsides of the nutrients essential for both grass and tree growth. (Cunningham and Hauser 1992) With the loss of ground or canopy cover, erosion of the loess mantle continued. (Hammer, personal communication) (Jacobson and Primm 1994) During this period of settlement, it was estimated that six to eight inches of surface soil had been washed away. (Law 1992) (USDA Forest Service 1952) From the end of the 1930's to the end of the 1950's, public land managers became concerned with healing the eroding lands, ending annual woods burning, and establishing young forests. Even so, it was 1969 before the period of free roaming livestock ended. (Law 1992) (Keefe 1987) As a result, many of the soils in the assessment area have shallow surface horizons, low available water holding capacities, and relatively low soil fertility

On Forest Service lands, past activities include timber harvesting and associated road building, landings, haul roads, mining and wildlife openings construction and maintenance. The past activities of timber harvesting and wildlife openings on National Forest system lands have had no long-term negative impact on the soil productivity with the mitigation measures applied. There is no evidence of accelerated erosion in the uplands. Areas where there have been timber harvests in the past have re-vegetated and there is no bare soil exposed in the closed cutting units.

Some of the roads in the Project Area will be reconstructed. There are a number of unclassified non-system roads that are present in some of the areas that could be used for temporary haul roads. This will reduce the amount of new roads needed and will reduce the amount of associated sediment movement. No appreciable long-term soil disturbance effects have been identified, primarily because of methods used and mitigation measures applied.

Current and future activities within the Doniphan Ranger District (other than the proposed action) include the Eastwood 2, Pine Bardley, Pine Knot. These projects are located over multiple management units and stands in a number of compartments and over thousands of acres. Activities in this proposal are regeneration harvesting, reforestation, timber stand improvement, hazardous fuel reduction and wildlife projects. Like the timber sales associated with Project Tornado, many of the soils in these areas exhibit perched water tables during winter months due to the presence of fragipans in the soil profile and are subject to erosion, compaction, and destruction of soil structure. Adherence to the Forest Plan Standards and Guides, mitigation measures in the E.I.S., and strict contract administration will be critical in minimizing detrimental impacts to the watershed resources.

On private lands past activities have included conversion of forested land to pastures, timber harvest, and road building. During the conversion process to pastures there was an increase in the sedimentation of streams and creeks and their tributaries. For a fuller description of this, refer to the watershed and water resource sections of this document. As common in the Ozark region, most of the riparian areas consist of private lands and surrounding uplands of perennial streams of the project area. In areas where the landowners left an adequate woody corridor along the perennial streams, the streambanks along the creek appear fairly stable. Other areas without an adequate woody corridor along the streams exhibit signs of accelerated bank erosion. The majority of the land clearing has been the conversion from hardwoods to cool-season grasses. Removing the hardwoods in the uplands and along the stream channel had a major impact on the stability of the channel. It is not known how much additional land will be cleared and what the associated sedimentation of the stream will be as a result of activities on private lands, though it should be similar to the past.

The management activities proposed under this environmental analysis will result in some soil disturbance. This disturbance will be a result of temporary roads, fireline construction, logging, and prescribed burning. The temporary roads (for all types of harvest methods) and firelines that are on the steeper slopes and/or cross the intermittent or ephemeral drainages will be the primary source of sediment in the unlikely event that sedimentation may occur. The sediment increase will be highest during construction and eventually will be reduced as the roads become stable and vegetated. This may take up one full growing season, but can be shorter if the re-vegetation and growing season are compatible. Closing and obliteration of the temporary roads is critical in bringing the erosion rate down to pre-harvest and pre-construction levels. Timber harvesting will have minimal impact on the sedimentation of the streams or drainages. Using the mitigation measures listed in this assessment and Forest Plan Standards and Guides, there will be adequate filter or buffer strips to help filter any sediment through the forest floor before reaching drainages.

In the stands that will have regeneration harvest, seldom is more than 5% bare soil exposed within the cutting units if proper care is taken during the harvesting and timber stand improvement process. The hardwood slash acts as a protective cover for the soils and can help mitigate compaction if used during harvesting. The stands that will have prescribed fire will have potential for soil erosion. This erosion will result from the construction of firelines and possibly from the burn unit. The increase in erosion from the burn unit is a direct result from fire intensity. Burning with a cooler fire the soil erosion is usually minimal, due to the protective duff layer that is still present. If there is an increase in soil erosion it is usually of very short duration. On the stands that will have various selection harvests (seed tree, shelterwood, thinning, sanitation cuts, uneven-aged management, overstory removal, etc.), some minor soil erosion is expected to occur. In these stands there will be enough ground cover or slash to protect any bare mineral soil. Mitigation measures listed in the Chapter 2 are effective in minimizing adverse impacts to the soils. Similar management activities will potentially be proposed in the reasonably foreseeable future and would be accompanied by the appropriate mitigation measures.

Alternative 3 – Silvicultural Need Emphasis

Timber Management – *Even-Aged Management* – *Regeneration Harvest*

Clear Cut

Clearcut harvesting would be done on the same 338 acres over the eight compartments of the project areas analyzed for Alternative 2. That analysis is applicable here and to repeat the analysisi for this alternative would not enhance the overall analysis of the project. See the analysis under **Alternative 2** for the topic:**Timber Management – *Even-Aged Management* – *Regeneration Harvest* - Clear Cut.**

Regeneration Harvest

Seed Tree

Seed tree cutting occurs on the same 88 acres over the eight compartments of the project areas analyzed for Alternative 2. That analysis is applicable here and to repeat the analysisi for this alternative would not enhance the overall analysis of the project. See the analysis under **Alternative 2** for the topic: ***Regeneration Harvest* – Seed Tree**

Regeneration Harvest

Shelterwood

Approximately 73 acres of shelterwood harvesting will be done under this alternative. The amount of bare ground after a shelterwood operation can be expected to be somewhat less than for a seed tree although erosion and ground disturbance during the harvesting operation would depend on the logger, amount of material extracted, ground based equipment employed, and the contract administration. Shelterwood would achieve crown closure a few years after harvest activity and erosion potential would decrease. Approximately 47 acres occur on ELT 17 and approximately 16 acres occur on ELT 18 but primarily occur on slopes less than 15 percent. The erosion potential is low.

Intermediate Harvest

Shelterwood Prep Cut

No ground disturbing activity is expected from the shelterwood prep cut. Materials extracted for poles or similar products should be confined to periods of dry soil conditions due to silt loams with a high compaction potential. Over time, as the foliage decomposes to organic matter and is incorporated into the litter layer and/or surface horizons, an increase in soil microorganisms and available nutrients can be expected to result.

Intermediate Harvest

Salvage

Salvage would be done over 35 more acres under this alternative. Since this is an intermediate harvest, this is not seen as a major difference from that analyzed in Alternative 2. The extent of ground disturbance would be proportional to the amount of material extracted and the harvesting equipment utilized. All operations would be done on ELT's 17 & 18 and on moderate slopes (15 – 35 percent). The erosion potential is moderate.

Intermediate Harvest –

Commercial Thin

Commercial thinnings are planned for 1262 acres as a part of this alternative. This reflects almost a 25% reduction in acres thinned from those acres analyzed in Alternative 2. These acres encompass a number of soils, ELT's and slope classes.

Across the project area, 15 stands occur on soils with fragipans and perched water tables. This is approximately a 50% reduction in the numberof stands on these soils. The actual acre reduction is 324 acres. Harvesting should be confined to periods of dry soil conditions (approximately November to June) to reduce compaction and damage to soil structure. Across the project area 35 stands occur on soils on stream terraces, floodplains, or foot slopes. An additional 74 acres were dropped from commercial thinnning and may include some of these stands. Harvesting in these areas need to pay special attention to erosion control so sedimentation in nearby streams does not occur. Some areas occur on other silt loams which can occur on ridgetops and/or toe slopes. These soils like the ones above can be susceptible to compaction.

Nearly half of the commercial thinning acres occur on ELT 17 & 18 in Alternative 2 and 324 acres are removed from this component in Alternative 3. The other half of thinning acres occur on ELT's 3, 5, 6, 11, 14, & 15, which occur on relatively neutral aspects and relatively gentle slopes, and have a greater compaction potential than areas on ELT's 17 & 18.

After harvesting and associated activities, crown closure would typically take place within five years. Erosion potential would be expected to decrease significantly after this period.

Timber Management – *Uneven-aged Management*

Group selection on 389 acres in this project takes place on ELT's 17 & 18 where erosion is most likely to occur. Thinning and timber stand improvement between group openings on 214 acres occur on moderate slopes (15 – 35 percent) indicating a moderate erosion potential. Group openings would be created on 42 acres that occur on ELT's 11 & 15 where soil compaction is most likely to occur.

Timber Management – *Uneven aged management – Intermediate - Natural Regeneration*

Ground disturbing activity is not expected on the 42 acres of openings. Impacts are expected to be minimal and from natural forces as natural regeneration fills the openings..

Timber Management – *Uneven aged management – Intermediate – Planting*

There is no planting proposed for group openings in any alternative.

Timber Management – *Uneven-aged management – Intermediate – PCT*

No ground disturbing activity is expected from precommercial thinning. Over time, as the foliage decomposes to organic matter and is incorporated into the litter layer and/or surface horizons, an increase in soil micro-organisms and available nutrients can be expected to result.

Wildlife Management – *Old Growth Management*

No ground disturbing activity is expected from old growth management and natural functions and processes is expected to occur.

Wildlife Management – *Open/Semi Open Land*

This treatment would only involve 34 acres and be accomplished through prescribed burning.

The effects of prescribed burning on soil erosion and nutrient loss discussed in Alternative 2 are applicable here but at an intensity reflective of a 96% reduction in the number of acres impacted.

Cumulative Effects

Most of the soils in the assessment developed in loess – a loamy material formed by glaciers and transported by wind – and in residuum from cherty limestone, dolomite, and sandstone. The soils are old, stony, highly weathered and acidic, except on some broad ridges and bottomlands. (USDA Forest Service, MTNF 2001)

Loess is a loamy, wind deposited material, most of which was deposited during glacial periods. In the assessment area, the mantle of loess varied in thickness from five feet to less than two feet, the loess deposits decreasing in depth in the southern most areas of the Ozarks. Soil conditions were described as ranging from "barrens and prairies …, the soils poor and covered with grass, …" to "the soil rich with a heavy growth of trees." (Nigh 1992) (Schoolcraft 1821) In many areas in this area, up to 90 percent of this mantle has been eroded away. (Scrivner, 1966) Aside from erosion occurring from geologic and other natural processes, erosion is a function of past land use. Clear cutting of pines, which began near the turn of the century and continued through the 20's and '30's, was followed by farming, annual burning and grazing. When the timber supplies were exhausted, local people turned to farming. Those attempting to pasture the cutover lands had to contend with resprouting of hardwoods . Intensive sheep and goat grazing and fire were the primary means of controlling hardwood regrowth and restoring grass cover. Repeat fires exposed the thin Ozark soils to erosion, which robbed the hillsides of the nutrients essential for both grass and tree growth. (Cunningham and Hauser 1992) With the loss of ground or canopy cover, erosion of the loess mantle continued. (Hammer, personal communication) (Jacobson and Primm 1994) During this period of settlement, it was estimated that six to eight inches of surface soil had been washed away. (Law 1992) (USDA Forest Service 1952) From the end of the 1930's to the end of the 1950's, public land managers became concerned with healing the eroding lands, ending annual woods burning, and establishing young forests. Even so, it was 1969 before the period of free roaming livestock ended. (Law 1992) (Keefe 1987) As a result, many of the soils in the assessment area have shallow surface horizons, low available water holding capacities, and relatively low soil fertility

On Forest Service lands, past activities include timber harvesting and associated road building, landings, haul roads, mining and wildlife openings construction and maintenance. The past activities of timber harvesting and wildlife openings on National Forest system lands have had no long-term negative impact on the soil productivity with the mitigation measures applied. There is no evidence of accelerated erosion in the uplands. Areas where there have been timber harvests in the past have re-vegetated and there is no bare soil exposed in the closed cutting units.

Some of the roads in the Project Area will be reconstructed. There are a number of unclassified non-system roads that are present in some of the areas that could be used for temporary haul roads. This will reduce the amount of new roads needed and will reduce the amount of associated sediment movement. No appreciable long-term soil disturbance effects have been identified, primarily because of methods used and mitigation measures applied.

Appendix J discusses the temporal and spatial relationship of past manageent actions to the NE Corner Area). These projects are located over multiple management units and stands in a number of compartments and over thousands of acres. Proposed actions are regeneration harvesting, reforestation, timber stand improvement, hazardous fuel reduction and wildlife projects. Many of the soils in these areas exhibit perched water tables during winter months due to the presence of fragipans in the soil profile and are subject to erosion, compaction, and destruction of soil structure. Adherence to the Forest Plan Standards and Guides, mitigation measures in the E.I.S., and strict contract administration will be critical in minimizing detrimental impacts to the watershed resources.

On private lands past activities have included conversion of forested land to pastures, timber harvest, and road building. During the conversion process to pastures there was an increase in the sedimentation of streams and creeks and their tributaries. For a fuller description of this, refer to the watershed and water resource sections of this document. As common in the Ozark region, most of the riparian areas consist of private lands and surrounding uplands of perennial streams of the project area. In areas where the landowners left an adequate woody corridor along the perennial streams, the streambanks along the creek appear fairly stable. Other areas without an adequate woody corridor along the streams exhibit signs of accelerated bank erosion. The majority of the land clearing has been the conversion from hardwoods to cool-season grasses. Removing the hardwoods in the uplands and along the stream channel had a major impact on the stability of the channel. It is not known how much additional land will be cleared and what the associated sedimentation of the stream will be as a result of activities on private lands, though it should be similar to the past.

The proposed actions, the subject of this environmental analysis, will result in some soil disturbance. This disturbance will be a result of temporary roads, fireline construction (minimal), logging, and prescribed burning. The temporary roads (for all types of harvest methods) on the steeper slopes and/or cross the intermittent or ephemeral drainages will be the primary potential source of sediment. The sediment increase will be highest during construction and eventually will be reduced as the roads become stable and vegetated. This may take up one full growing season, but can be shorter if the growing season is favorable. Closing and obliteration of the temporary roads is critical in bringing the erosion rate down to pre-harvest and pre-construction levels. Timber harvesting will have minimal impact on the sedimentation of the streams or drainages. Using the mitigation measures listed in this assessment and Forest Plan Standards and Guides, there will be adequate filter or buffer strips to help filter any sediment through the forest floor before reaching drainages.

Stands that will have regeneration harvest seldom have more than 5% bare soil exposed if proper care is taken during the harvesting and timber stand improvement process. The hardwood slash acts as a protective cover for the soils and can help mitigate compaction. The stands that will have prescribed fire will have potential for soil erosion. This erosion will result from the construction of firelines and possibly from the burn unit. The increase in erosion from the burn unit is a direct result from fire intensity. Cooler fires result in reduced soil erosion, due to the protective duff layer that is still present. If there is an increase in soil erosion it is usually of very short duration. On the stands that will have various harvests (seed tree, shelterwood, thinning, sanitation cuts, uneven-aged management, overstory removal, etc.), some minor soil erosion is expected to occur. In these stands there will be enough ground cover or slash to protect any bare mineral soil. Mitigation measures listed in the Chapter 2 are effective in minimizing adverse impacts to the soils. Similar management activities will potentially be proposed in the reasonably foreseeable future and would be accompanied by the appropriate mitigation measures.

Transportation System

Current Conditions

A Roads Analysis Report (RAP) was done for existing roads in the immediate NE Corner Projects Area (Management Area 4.1-12) and in Compartments 288 and 300 (also Management Areas 4.1-12. The area involved in the roads analysis process is described in further detail in the RAP, incorporated by reference here in this NE Corner Projects environnmental assessment. The project area contains approximately 21.1 miles of Forest Service system roads, approximately 4.9 miles of non-system road segments attached to Forest Classified roads and approximately 12 miles of non-system roads. The 4.1 Management Prescription allows up to 2 miles of road per square mile of National Forest land and the current road density is 2.5 miles/square mile. System roads are identified on the Forest Plan Transportation System Map as 1) arterial and collector roads, 2) constant-service roads, 3) intermittent-service roads, 4) woods roads, and 5) roads to be developed.

Non-system roads are roads that have been in place since the early 1900's when the area was more heavily populated and have continued to be used for recreational and timber harvesting purposes, and for access to private property. Some of these roads have been closed, either intentionally or by discontinued use/natural forces, but a number of roads have remained open because of continued recreational use. The condition of these roads is usually fair to poor due to lack of maintenance.

Direct and Indirect Effects

All system roads are currently in place. The need for road reconstruction, improvement or maintenance is based on proposed resource management projects, management area objectives, and the need for resource protection. The intent of any road reconstruction is to maintain long-term access into an area with the least disturbance possible. Part of the "least disturbance" objective is to ensure resource damage does not occur in the future after reconstruction. Road reconstruction increases the amount of vegetation and soil disturbance in the short term while providing long-term load bearing strength and stabilization. Short-term soil disturbance increases because of ditching and outlet ditch construction along most of the length of the road.

Normal maintenance and woods road improvement are preventative and/or are intended to stabilize the existing road while minimizing soil and vegetative disturbance.

Alternative 1

In this alternative no reconstruction of system roads or closure of non-system roads would occur. Routine maintenance of system roads would occur.

Alternative 2

In this alternative approximately 11 miles of system road would be reconstructed and aproximately 11 miles of non-system road would be identified for closure. Several segments of road (totaling approximately 1 miles) would be involved in various special use permits for access to private land. Road density would be reduced to 1.8 miles/square mile by the closure and elimination of a drivable surface of 11 miles of non-system roads. Approximately 10 miles of skid trails and 5.0 miles of temporary roads would be constructed to remove timber and then closed and rehabilitated following harvesting.

Alternatives 3

Road actions would be virtually the same as Alternative 2 with the same effects expected.

Cumulative Effects

The road density for the entire management area would be approximately 2.5 miles/square mile under Alts. 1 (No Action) and under Alternatives 2 and 3 1.8 miles/square mile with the elimination of approximately 13 miles of non-system roads as identified in the NE Corner RAP. With current levels of road maintenance, future road reconstruction would be required on the constant service roads every decade. Woods roads would be improved to minimum standards when projects take place.

The mitigation measures currently employed and found in the Forest Plan Standards and Guidelines, such as seeding and fertilizing or ground operating restrictions, ensure the integrity of the roads is maintained. Past transportation system activities, currently proposed actions, and reasonably foreseeable future activities do not pose any significant negative impact on access to or use of the project area or it's vicinity.

Heritage Resources

Definition of Effects and Area of Potential Effect

An Effect to a cultural resource is defined as "…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." [36 CFR 800.16(i)]. An Adverse Effect is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." [36 CFR 800.5(a)(1); see also subsection (a)(2)]. Effects to cultural resources may be either Direct or Indirect.

The Area of Potential Effect is defined as "…the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties…. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." [36 CFR 800.16(d)].

Direct Effects

With respect to the Northeast Corner project, direct effects are those that will occur during project implementation. These effects can occur during implementation of forest management activities, as well as during some kinds of road maintenance and reconstruction. In essence, any activity that has the potential to disturb the ground has the potential to directly affect archaeological sites. Prescribed burning may also directly affect archaeological and architectural sites not only by construction of fire lines with heavy equipment, but also by damage and/or destruction of cultural features and artifacts by the fire itself.

Specific activities outlined in the Northeast Corner project alternatives that have the potential to directly affect cultural resources, and therefore, are considered to be undertakings for the purposes of this project include the following (see Attachment D also):

Forest Management and Wildlife Habitat Management:
Commercial timber harvest
Construction of landings, temporary roads, skid trails
Prescribed burning

Roads

Maintenance of Forest Service Roads that are not currently maintained and where ground disturbance takes place outside existing road prisms and ditches
Road realignment
Road reconstruction depending on the specific nature of the reconstruction
Road closure using ground disturbing methods, such as construction of a pit and berm

The Areas of Potential Effect for the above-listed Northeast Corner project activities are those geographic areas in which the ground disturbing activities will take place.

Activities proposed in the various alternatives that DO NOT have the potential to affect cultural resources, and therefore, are not considered to be undertakings for purposes of this project include the following:

Forest and Wildlife Habitat Management:
Pre-commercial thinning [cutting small diameter trees with a chainsaw, dropping, and leaving in place]
Designation of Old Growth

Roads

Continued maintenance and reconstruction of Forest Service Roads where ground disturbance does not take place outside existing road prisms and ditches and depending on the nature of the reconstruction.
Road closure using non-ground disturbing methods, such as placement of large boulders across road

Indirect Effects

In general, project activities of the kind proposed for the Northeast Corner project have the potential to indirectly affect cultural resources by opening up areas of the forest in which cultural resources are located to increased visitor use. Increased visitor use of an area in which archaeological sites are located can render the sites vulnerable to both intentional damage, as well as unintentional damage. Intentional damage can occur through unauthorized digging in archaeological sites and unauthorized collecting of artifacts from sites. Unintentional damage can result from such activities as driving motorized vehicles across archaeological sites, as well as from other activities that disturb the ground during dispersed recreational use.

Cultural Resources Surveys

Cultural resources inventory surveys in the Northeast Corner project area have focused on those stands and areas in which activities are proposed that have the potential to affect archaeological sites, as outlined above (Definition of Effects and the Areas of Potential Effects). To date, approximately 2898 acres have been surveyed for cultural resources in the Northeast Corner Project Area stands in which ground-disturbing activities and/or prescribed burning have been proposed (See Price 2003, Tables in Attachment B). These acres include approximately 2715 acres in which harvest activities are proposed and 183 acres in which only prescribed burning is proposed. In addition to these areas in which activities area proposed, in 2000-2003, another 555 acres were surveyed in the Compartments included in the Northeast Corner project in which no ground-disturbing activities are proposed.

With the exceptions described below (Survey Limitations), as of the date of this report, cultural resources surveys have been completed in all stands in which ground disturbing activities and prescribed burning have been proposed in all project alternatives. Maps providing information on the location of cultural resources surveys in the project area and a listing of reports documenting the cultural resources surveys in the Northeast Corner Project Area to date may be found in Price (2003).

Survey Limitations

Cultural resources surveys have not necessarily been completed for all of the following proposed activities:

1. Temporary Roads, skid trails, and landings for commercial timber harvest.
2. Forest Road reconstruction and realignment.
3. Previously burned prescribed burn unit in Compartment 282 (see below, Prescribed Burns in Previously Burned Units).
4. Selected stands in the large Big Hollow Prescribed Burn in which timber has been harvested in the past (see below, Big Hollow Prescribed Burn).
5. Dozer-constructed firelines for the Big Hollow Burn, depending on specific fireline locations.
6. Road closures, if berms are to be constructed or other ground disturbing methods are to be used.

At least some of the activities noted above may be carried out in stands that have been surveyed for other reasons. For example, skid trails, landings, and temporary roads may be located in stands that have been surveyed for timber management activities, and firelines may be constructed in stands surveyed for the burns. In such cases, the areas will not be re-surveyed. Areas in which the above activities will take place that have not yet been surveyed for cultural resources will be surveyed, and Section 106 consultation will be completed prior to project implementation.

Cultural Resources

Thirty-two (32) archaeological sites have been identified in, and near, the Northeast Corner Project Area. Of these thirty-two sites, six (6) contain evidence for prehistoric activities and twenty-eight (28) contain evidence for historic period activities. In addition to the archaeological sites, thirteen (13) isolated finds (consisting of a single or a very few historic artifacts not associated with any cultural features), twenty six (26) historic features (isolated historic features such as rock piles that are not associated with a larger archaeological sites or with artifacts), were also recorded in the project area. The cultural resources are described in Price (2003 as amended, October 2003).

The historic period sites include principally farmstead core areas, or rural residences dating to the early twentieth century; a small iron mine; narrow gauge railroad, or tram, beds associated with the late nineteenth and early twentieth century logging industry in the eastern Ozarks; historic field locales; as well as several sites of yet unidentified function and age. The prehistoric sites include principally seasonal camps, which were probably occupied by small groups of people on a seasonal, or short-term, basis.

The Isolated Finds include such items as buckets, lard buckets, fragments of a cross-cut saw, rolls of fencing, glass Purex bottles, food cans, and pieces of old automobiles. The Historic Features include principally such features as small trash dumps that cannot be associated with a particular homesite and rock walls, rock lines and rock piles associated with historic agricultural field clearing activities. In general, most of the Isolated Finds and Historic Features appear to be associated with early to mid-twentieth century agricultural settlement in the NE Corner area. The fragments of the cross-cut saw may also be associated with the turn-of-the-century timber industry in the area as well.

With few exceptions, investigations at the archaeological sites to date are insufficient to fully evaluate them against the National Register of Historic Places significance criteria as found in 36 CFR 60. The archaeological sites, therefore, are being managed as unevaluated properties that appear to meet one or both of principally two National Register of Historic Places significance criteria as found in 36 CR 60.6:

1. Criterion A: That are associated with events that have made a significant contribution to the broad pattern of our history;

2. Criterion D: That have yielded, or may be likely to yield, information important in prehistory or history.

The sites are afforded protection from project activities that may harm the sites in the same manner as eligible sites are protected.

Per the terms of the 2002 Memorandum of Understanding (MOU) between the Missouri State Historic Preservation Officer (SHPO) and the Mark Twain National Forest, neither the isolated finds, nor the historic features, are considered to be eligible for inclusion in the National Register of Historic Places [MOU, 2002, Section II G (1) and Appendix C]. Because they are not considered to be historic, or eligible, properties, the finds and features are not necessarily protected during project implementation.

Expected Effects of Project Activities on Archaeological Sites

Summary statements of expected effects for the activities proposed in the various alternatives are presented in this section. Tables in Attachment C in Price (2003, as amended in October 2003) provide additional information on expected effects on individual sites.

Direct Effects

In general, the effects on the cultural resources of the various activities that are proposed for this project are expected to be as follows:

(1) In those stands and project areas where no historic properties (archaeological sites meeting National Register criteria) are present, the proposed project activities have No Potential to Affect cultural resources.

(2) In those stands and other project areas in which ground disturbing activities would be carried out as listed above, (see Definition of Effects and Areas of Potential Effect), where historic and/or unevaluated properties are present, and where Site Avoidance (Mitigation Measure CR1) is feasible and is implemented, the proposed project activities are expected to have No Effect on cultural resources.

(3) In those stands in which prescribed burning would be carried out, where historic and/or unevaluated properties are present, and where the mitigation measures described in Mitigation Measure CR2 are applied, the proposed project activities are expected to have No Adverse Effect on cultural resources.

(4) Where archaeological sites occur along routes of access (such as old woods roads that have not been maintained) and where site avoidance (CR1) is not feasible, the Mitigation Measure CR5 will be applied with the expectation that a mitigation plan can be developed to result in a finding of No Adverse Effect on cultural resources.

Indirect Effects

In the case of the NE Corner Project Area, increased site vulnerability is expected to be the principal indirect effect to cultural resources resulting from activities included in the action. With application of appropriate mitigation measures, principally with Mitigation Measure CR1, Site Avoidance, it is not expected that the proposed project activities in any of the alternatives will increase visitor use in those areas in which archaeological sites are located. It is not expected, therefore, that implementation of the proposed activities will have indirect effects on the cultural resources.

Comparison of Effects of Proposed Project Activities on the Archaeological Sites by Alternative

Alternative 1: There will be no effects on the cultural resources over the existing condition with selection of this alternative.

Alternatives 2 and 3: Because, with the exception of the prescribed burning, there is little difference in the two alternatives with respect to possible effects on the archaeological sites, there is little difference in the effects on the sites with selection of either alternative. There is no difference in the expected effects on the archaeological sites with the different commercial harvest activities, for example. So that the effects on an archaeological site located in a stand in which commercial harvest is proposed are expected to be the same regardless of harvest method. With implementation of appropriate mitigation measures, sites located in any stand in which any form of harvest is proposed are not expected to be affected by project implementation. Those sites in the prescribed burn units are not expected to be adversely affected by the proposed burning.

The table below provides a comparison by alternative of the number of archaeological sites for which determinations of No Effect and No Adverse Effect have been. The remaining archaeological sites (of the total 31 identified in the Northeast Corner project area) are in stands in which either no activity, or no ground-disturbing activity, is proposed.

Expected Effects	Alternative 2	Alternative 3
No Effect	19	21
No Adverse Effect	5	1
Total No. Sites in Activity Stands	24	22

Cumulative Effects

Because it is not expected that any of the proposed project activities, with implementation of appropriate mitigation measures, will adversely any of the eligible and unevaluated archaeological sites, it is not expected that there will be any cumulative adverse effects to the cultural resources with implementation of any of the three alternatives. It is expected that there will be no change in the condition of the cultural resources over the existing condition.

Air Quality

Existing Conditions

According to the Ozark-Ouachita Highlands Assessment (OOHA), the major types of air-pollution emissions with the potential to impact the natural resources of the Highlands are particulate matter, nitrogen oxides, volatile organic compounds, and sulfur dioxide. Emissions of particulate matter are greatest along the northern and western boundaries of the Assessment area, where they are usually generated by fugitive dust sources (e.g., sources of uncontrolled or unducted dust emissions such as dirt roads or agricultural fields). Emissions in the future are expected to remain constant unless wildland fires or prescribed fires increase beyond current levels. Motor vehicles and electrical utilities are the usual sources of nitrogen oxides nationally. In the Assessment area, however, fuel combustion at industrial sources is the major source of these emissions. Current measures by the Environmental Protection Agency are likely to reduce emissions of nitrogen oxides from electrical utilities and possibly from other sources.

Nationally, and in the Highlands, motor vehicles are the main source of volatile organic compounds caused by human activities. Available data were insufficient to project how volatile organic compounds will change in the future. Fuel combustion from electrical utilities is the greatest source of sulfur dioxide in the Highlands area. A reduction in the amount of emissions is expected in the future due to the enactment of and full compliance with the Clean Air Act amendments of 1990.

Particulate matter concentrations show a definite seasonal trend over the Assessment area, with the highest concentrations occurring during the summer months. Most prescribed burning done in the Assessment area occurs in March. The Assessment area as a whole is well within the National Ambient Air Quality Standards for particulate matter.

A definite seasonal pattern exists for visibility. The best visibility occurs during the fall, and the worst visibility occurs during the summer. Visibility impairment in the form of regional haze exists with the Assessment area. Sulfates are the primary aerosols responsible for such impairment. Compliance with the Cleam Air Act amendments of 1990 should reduce sulfates and improve visibility.

Ozone exposures result from the chemical reaction of nitrogen oxides and volatile organic compounds. The volatile organic compounds are so abundant that it appears nitrogen oxides may be the limiting factor in ozone formation. Using available ozone monitoring data, it appears that ground-level ozone had a minimal impact on forest tree growth in the Assessment area between 1990 and 1995.

Acid deposition can pose a threat to forest ecosystems especially on poorly buffered, higher elevation watersheds. Acid deposition patterns in the Assessment area are affected by emissions of sulfur dioxide and nitrogen oxides and by the patterns of precipitation over the region. Future reductions in the emissions of sulfur dioxide and nitrogen oxides should lead to reduced atmospheric sulfate and nitrate concentrations, thereby reducing the potential for acid deposition episodes.

Future changes in precipitation patterns as a result of changes in regional climate may also influence the amount of acid deposition over the Assessment area. Atmospheric wet acid loadings in the Assessment area are less than the loadings observed in the Southern Appalachian region and other parts of the Eastern United States. Nitrate and sulfate loadings are expected to decrease in the future in response to regulatory programs. Most surface waters within the Assessment area do not appear to be adversely impacted by the previous and present rate of acid deposition. The limestone areas of the Ozark Plateau are least at risk due to their high acid neutralizing capacity.

Federal air quality guidelines have established three classes for air quality control for the prevention of significant deterioration of existing conditions. The entire proposed harvest area is within the Class II category that allows for moderate deterioration associated with limited and managed growth.

Alternative 1: No Action

Vehicles will continue to use the project area roads and cause temporary local decreases in air quality due to engine exhaust. Wildfires may occur and have a temporary negative impact on local air quality. Otherwise, the quality of air would continue to be influenced by human activities other than those proposed in this document.

Alternative 2

Prescribed burning would occur on approximately 692 acres. Prescribed burning is conducted on days when predicted weather is suitable for rapid smoke dispersal. The large Big Hollow Burn is not adjacent to any private land. The 34 acres of open land maintenance burning have only a minimal length of boundary common with sadjacent private land. Wind direction would need to be considered to avoid adversely affecting these areas. Smoke could temporarily impair sight distance on Forest Roads 4269, 3167, and 3167C. This would pose a hazard to motorists, although neither road carries a high volume of traffic nor are they traveled at a high rate of speed.

Two forest fuel burning models SASEM (Simple Approach Smoke Estimation Model) and FOFEM (First Order Fire Effects Model) were used to calculate smoke emissions, both as particulate matter (SASEM) and then as the six criteria pollutants of ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter , and lead. The results of the SASEM 4.0 run for the Big Hollow Prescribed Burn indicated no exceedence of Particulate Matter (PM) 2.5, PM 10 or TSP Emissions under atmospheric stability conditions of excellent, good, and fair with any wind speed 1 to 25 miles per hour. Exceedence could occur with poor atmospheric stability and winds less than 5 miles per hour. Burn plans (required) set the conditions under which the prescribed burn would or would not be implemented. National Weather Service forecasts are used to anticipate changes in weather conditions that could place burning conditions outside of prescriptions. Wind direction is also considered and with a restriced wind direction from the south to west (180 to 270 degrees) no visual impact is predicted with the P&V and Kosh Estimate at any of the 7 identfied smoke receptors. These receptors are the towns of Winona and Fremont, State Highway H, State Highway 19, State Highway P, State Highway W, and U.S. Highway 60. SASEM and FOFEM reports are available in Appendix D, under “Air Quality”.

Alternative 3

Prescribed burning would occur on approximately 34 acres (Compartment 282/Stand 52). Prescribed burn planning indicated above applys to this 34 acre burn. The nearest roads where smoke could temporarily impair sight distance are Forest Roads 4264, 3167, and 3167B. Although this could pose a hazard to motorists, none of these roads carry high volumes of traffic nor are they traveled at a high rate of speed.

Cumulative Effects

The NE Corner Projects Area lie adjacent to Missouri Department of Conservation’s (MDC) Peck Ranch and Rocky Creek Consrvation Areas. Coordination with MDC on these two conservation areas with the timing of prescribed burns planned by the respective agencies will minimize cumulative effects. Additional wildlife habitat improvement prescribed burns, planned on the Doniphan/Eleven Point District, are scattered and smoke dispersal would be expected, under conditions identfied in the required burn plan, to reduce any concentration from any of the five planned prescribed burns to minimal to none. The 7 receptors listed above would not be expected to be impacted and SASEM and FOFEM model runs would also identify any new receptors to consider. Past prescribed burns have been shown to have no impact and no exceedence of EPA air quality standards for receptors identified prior to implementing burns. This project area contains a walk-in turkey area. Limiting impacts to turkey hunting would simply be to not burn during the turkey seasons. Turkeys will find burned areas good for seed and bugging areas.

Cumulative Effects: Prescribe Burning Northeast Corner Project

Past Management:

Previous management of northeast corner had limited prescribe burning. The hollow bottom in Martin Hollow (est 40 ac) was burned in 1981, the warm season field (Barns field-35ac) was burned in 1989 and 1993, and the open fields in Sycamore Hollow (49 ac) were burned in 1993 and 1997. In summary, since 1980 there has been 124 acres of the northeast corner project prescribe burned. All of these areas have been omitted from the prescribe burn program since 1997 because the areas were just too small and not economical to continue burning. The vegetative effects from these burning projects were very limited and temporary. Today, there is not much indication these areas were ever prescribe burned.

In the early 1980's the were several wildfires throughout the area. It was common to find multiple fires set along Forest Road 3167 (Low Wassie road). With the routine nature of fires in this area there are some stands that still show effects from the wildfires.

Future Proposals/Effects:

The only prescribe burning project proposed is the 658 acre Big Hollow burn. This large ecosystem landscape burn will accomplish several objectives. This burning will enhance many of the grasses, sedges, and forbs while reducing the smaller hardwood and brush species. The existing overstory pine will be enhanced and an open understory condition will occur and will be noticeable within 2-3 burns. The objective of this large ecosystem prescribe burn unit is to create a shortleaf pine savnna condition with large widely spaced pine trees and some hardwoods with an open understory of warm season grasses. Visibility through the stand after repeated burns will approach a quarter mile. There will be a significant change in the visual condition along Forest Road 3167 with the open understory.

Cumulative effects: This burn project along with other burning occurring on National Forest, Missouri Department of Conservation, Nature Conservancy, private, and National Park Service will be considered minor in consideration of total effects of smoke management and shortleaf pine ecosystem restoration. It is estimanted that within a 10 mile radius of this project area there will be approximately 6,000 acres of prescribe burning annually. The Big Hollow burn would represent 11% of this total. It is anticipated that prescribe burning will increase in the southern Ozarks and is very likely to expand to 2-3 times the current amount, thus making the Big Hollow burn less significant as other burning increases.

Biological Factors

Wildlife
Current Situation

Wildlife within this project area is typical of the oak-hickory-pine upland forest, which comprises the majority of the area. Occurrence and distribution of individual species and individual animals of a species depend on the existing vegetative cover, structure, age, and spatial distribution described in the vegetative effects section of this document.
Information on the occurrence and distribution of invertebrate species is lacking for Missouri (The Biodiversity of Missouri Definition, Status, and Recommendations for its Conservation Report of the Biodiversity Task Force, March 1992, pages 37 & 38). In spite of this lack of information, there is no doubt that these species play vital roles in the functioning of ecosystems. To our knowledge, there is no research currently being done on invertebrate species occurrence and/or distribution in Missouri.
Because of the vast number of species, their small physical size, and the lack of on-going research, it is unlikely that information will be available in the forseeable future.

Considering the past history of natural disturbance and human use in the project area, the scale of the proposed projects, and the use of techniques, which imitate natural disturbance (prescribed fire for wildfire, tree harvest for windstorm, insect/disease outbreaks, natural mortality), the lack of information on invertebrates should still make a reasoned choice between alternatives possible.

Forest Plan Standards for Wildlife Habitat:

Page IV- 128 - 129 of the Forest Plan discusses these objectives within 4.1 management prescription.

The following standards & guides show habitat conditions, which will be "sought in the attainment of Management Prescription" 4.1 "steady state" objectives. The objective of each plan period will be to move habitat conditions toward these steady-state objectives as individual management area opportunities permit. This means that projects do not necessarily have to achieve the standards & guides within the 10-year planning period, but should either move the area toward those objectives or at the least, not preclude moving toward them in the future.

Table 5
Selected Forest Plan Standards & Guides for Wildlife Habitat
for NE Corner Project
Oak-Pine Hills & Oak-Pine Breaks LTA
(in percent of National Forest System land)

Habitat Condition	4.1 Forest Plan Standard	Existing Condition [1)]
0-9 age class	8-15%	0% [2)]
Old Growth	8-10%	8 %
Open/Semi-open	4-10%	2 %
Mast (OH/OP >50)	30-45%	58%

1) % of project area 2) 1999-2008 planning period

Threatened & Endangered Species:

The Forest Service is legally required to provide protection to insure survival of federally listed species. A Biological Evaluation (BE) for these species was conducted and is found in Appendix H. There are no federal listed species documented to occur in the project area. There is no critical habitat for any species in the project area, on the Doniphan/Eleven Point District, or on the Mark Twain National Forest.

The BE discusses potential effects to federal species which could possibly occur in the area or that may potentially be affected and concludes that there would be no additional effects to these species beyond those discussed and evaluated in the 1998 programmatic Biological Assessment and 1999 programmatic Biological Opinion.

The BE also determined that the activities proposed in the NE Corner project area (and all alternatives) comply with the Reasonable and Prudent Measures and Terms and Conditions of the June 23, 1999 US Fish and Wildlife Service's Biological Opinion. The US Fish & Wildlife Service has reviewed the Forest Service BE and concurred with its findings on November 6, 2003 (See Appendix H)

There are two documented locations for Regional Forester Sensitive Species in the project area. These species are the epiphytic sedge (*Carex decomposita*) and pale mana grass (*Torreychloa pallida*). These species were documented within the Marg Pond Natural Area. This area is protected and will not be disturbed with any activity in the NE Corner Project Area. The RFSS BE discusses potential effects to Regional Forester Sensitive Species listed species which occur or could possibly occur in the area and concludes that Alternatives 2 and 3 may impact the Loggerhead Shrike, but will either have a potential Beneficial Impact or No Impact to the other species considered.

Two state endangered species, Cooper's hawk and sharp-shinned hawk, have been documented within the NE Corner Project Area. No activities in Alternatives 2 and 3 are scheduled within the stand where Cooper's hawk was last found nesting in 1988. Commercial thinning is prescribed for the stand where the sharp-shinned hawk was found nesting in 1985. The nest was inactive in 1988. If any evidence is found to provide that this nest or another is being used, a buffer zone will be established around the nest area to ensure that there are no direct effects to this species.

Three additional species with potential habitat were addressed in the state endangered species' BE. These species, northern harrier, barn owl and plains spotted skunk are not known to exist within the NE Corner Project Area. Habitat for these species would be maintained in Alternative 2 and 3. Under Alternative 1, habitat would eventually be lost as succession occurs. There would be no effect on state-endangered species as a result of implementation of the action alternatives.

<u>1999 BO Reasonable and Prudent Measures</u>

To comply with mandatory Reasonable and Prudent Measures and their associated Terms and Conditions of the 1999 Biological Opinion, the following mitigation measures will be implemented:

WL1: Even-aged harvests (clearcut, seedtree, shelterwood seedcut): Retain a minimum of 15 sq. ft. of basal area (in clearcut and seedtree harvests) and a minimum of 25 sq. ft. of basal area (in shelterwood seedcut harvests) or reserve trees grouped aor retained around large snags, large live trees, den trees and within intermittent drainages to minimize potential for windthrow and provide thermal protection of suitable Indiana bat roost trees. Leave larger, long-lived trees (white oak, post oak, pine or hickory) where opportunities exist.

Uneven-age harvests (group selection with improvement cutting) – The longer-lived trees (white oak, post oak, hickory and pine) will be featured leave trees with diameter distribution. Snags and dens from red oaks will be left, if available, to meet standards and guidelines.

WL3: In all harvest area, retain shagbark hickory, shellbark hickory and lightning struck trees >= 9" dbh. Retain, as available and to the maximum extent possible and logistically practical, any existing dead trees >= 20" dbh and any tree >= 26" dbh unless a human safety hazard. Also, retain dead or dying trees >=9" dbh with at least 10% exfoliating bark and most den/cull trees.

WL5: If bald eagle night roosts are discovered at any time during the course of activities described in this EA, they will be protected by designating a protective buffer around the roost as shown in the Forest Plan.

WL6: If Indiana bat maternity or summer male roosts are discovered at any time during the course of activities described in this EA, they will be protected from disturbance and the FWS will be notified immediately.

Species Considered

Federal species considered in the NE Corner Biological Evaluation are the 10 species considered in the 1998 programmatic Biological Assessment, as well as Hine's emerald dragonfly and the Ozark Hellbender. This Hine's emerald dragonfly has been found in a few locations on MTNF since the 1999 Biological Opinion was issued and the Ozark Hellbender is a proposed candidate species for listing.

The federal species list was reviewed and approved by Dr. Paul McKenzie of the Columbia Ecological Services Field Office of the US Fish and Wildlife Service, Columbia, Missouri on 7/31/2002.

Regional Forester Sensitive Species considered in the NE Corner Biological Evaluation are those included in the list dated 2/29/2000. The Regional Foresters' Sensitive Species List (RFSS) was first issued on March 8, 1994. An updated RFSS list was issued on February 29, 2000. As a result, the Mark Twain National Forest portion of the updated RFSS list contains 127 species.

The updated list retains 44 of the 69 species from the 1994 list and adds 83 new species. Designation of RFSS helps maintain species viability and avoid trends toward federal listing under the Endangered Species Act. Risk evaluations were completed for each species considered for listing and are on file in our Regional Office. Those evaluations are hereby incorporated by reference for this analysis.

In April 2001, the Mark Twain National Forest completed a Supplemental Information Report on Regional Forester Sensitive Species. The analysis demonstrates how the 1986 Mark Twain National Forest Land and Resource Management Plan (Forest Plan) provides for ecological conditions that may lead to ensuring viable populations of these sensitive species. It concluded that the current Forest Plan adequately addresses habitat needs of all the species included on the list. By following the standards and guidelines in the current Forest Plan, the Mark Twain National Forest will provide habitat conditions conducive to maintaining viability of these species. The SIR is on file at the Supervisor's Office in Rolla and is hereby incorporated by reference.

Of the 127 species listed for the Mark Twain National Forest, 59 species are known to occur or may occur on the Doniphan/Eleven Point Ranger District. Appendix H lists the 59 species, known occurrences, and suitable habitats. It also lists the reasons for excluding the other 68 species from this evaluation. The RFSS BE explains which of the 59 species are known to occur or may occur within the NE Corner Project Area. The BE also includes the rationale for excluding species from analysis of potential effects of the NE Corner Project alternatives.

Threatened, Endangered, Proposed and Sensitive Species Surveys:

In partnership with Mark Twain National Forest and others, the Missouri Department of Conservation has been very aggressive in conducting species surveys and maintaining data on both listed and common species. The Missouri Heritage Database not only includes specific locations of plant and animal species, but also includes occurrences of unique and/or rare natural communities. Many of these communities are suitable habitat for federal or Regional Forester sensitive species. This database provides an excellent and up-to-date source of information on occurrences of TES species. Missouri Heritage database has no documented occurrences of any TES species in the NE Corner Project Area.

The Missouri Fish and Wildlife Information System (MOFWIS) includes information on over 700 species of animals and plants (life history, status, known and possible locations, etc.). This database is also an excellent source of information regarding possible locations of TES species on the Mark Twain National Forest. Federally listed species described in the Missouri Fish and Wildlife Information System as known or likely to occur in Shannon County are the bald eagle, gray bat and Indiana bat.

Species experts in Missouri have also been very aggressive in publishing excellent reference material that includes species locations in the state as well as potential habitat. Publications include: Missouri Wildflowers, Missouri Orchids, Field Guide to Missouri Ferns, Walk Softly Upon the Earth (lichens and mosses), Steyermark's Flora of Missouri, Flora of Missouri, Volume 1, Butterflies and Moths of Missouri, The Crayfish of Missouri, The Fishes of Missouri, Naiades of Missouri, Birds of Missouri, and The Amphibians and Reptiles of Missouri.

Natureserve, a non-profit organization, provides specific information on species locations, habitats, threats, propagation, life history, etc. The Natureserve explorer website (http://www.natureserve.org/explorer/) contains detailed information on a variety of species and natural communities.

In addition to the extensive fieldwork done in preparation of the Missouri Heritage and MOFWIS databases and the publications, there are numerous field surveys conducted annually or as part of research projects in Missouri. The Mark Twain National Forest has also conducted surveys in partnership with others and on its own. Examples of these include, but are not limited to:

Annual mid-winter bald eagle surveys
Annual bald eagle nest surveys
Forest bat surveys (cave, fall, summer, winter, mist-net, harp-trap, Anabat)
Missouri Breeding Bird Atlas
Missouri Breeding Bird Survey Routes
Cave Research Foundation Biological Inventories
Gardner & Gardner Cave Inventories
Botanical Surveys
Naiades survey 1980-1982

These surveys are relevant to the NE Corner Project area. While not all of them were conducted specifically on the NE Corner Project Area, they provide information concerning suitable habitats for various species on the district. Of the twelve species considered, three have potential habitat or may be affected by activities in the NE Corner Project Area.

The information available on TES locations and potential habitats in the NE Corner Project Area is of sufficient quantity, quality, and relevance to make an accurate and complete analysis of potential effects on TES species in the NE Corner Project area. I believe enough information is available to make a reasoned management decision.

Specialized Habitats:

There are 8 (eight) known sinkholes. There is one Missouri Natural Area (Marg Pond), one small glade approximately 0.5 acres in size and 1829 acres of shortleaf pine forest within the project area.

Management Indicator Species:

Management Indicator Species (MIS) were selected for the Mark Twain National Forest during forest planning in accordance with CFR 219.19. MIS are representatives for estimating the effects of forest management on populations of other species. MIS for the Oak-Pine Hills and Breaks are: pileated woodpecker, ovenbird, woodthrush, indigo bunting, eastern wild turkey, white-tailed deer, raccoon, ruffed grouse, and bobcat (FLMP IV-58). Populations of each of these MIS in this project area are unknown. Projections of MIS populations were made using PATREC models during the IRM Step 2 analysis for each Management Area.

To evaluate effects of the proposed action and alternatives on MIS, habitat availability will be assessed. Habitat objectives indicative of minimum viable populations of MIS are shown on page IV-61 of the Forest Plan.

Neotropical Migrant Birds

See discussion under Biological Diversity #5 and Appendix F.

Direct & Indirect Effects of Alternatives

Every action affecting vegetation has the potential to affect wildlife located on the Forest and on adjacent private lands. In addition, such factors as weather, food availability, disease, and predation affect species populations independent of any management activities. Some wildlife species are affected differently from other species, which use the same general habitats or vegetation communities. Many species may utilize several or many different habitats.

Activities or natural circumstances affecting habitats other than the project stands which these animals might use could have an impact on MIS populations independent of the changes predicted in this document.

The Pileated woodpecker, ovenbird, and wood thrush represent forest interior species. The woodpecker also is used as an indicator of those species, which require cavity trees. The indigo bunting represents species, which require openings or forest/opening edges. The remaining MIS (turkey, deer, raccoon, grouse, bobcat) are all able to use varying types of habitat, although they may prefer one or more types to others.

The following predictions of population changes due to management activities are for wildlife populations for the next 10 years within this project area only.

Alternative 1 (No Action):

No vegetation management activities would take place, therefore no management-related changes in MIS populations would occur during this management period. Within the next 10 years, it is unlikely that there would be any noticeable changes in species populations within the area.

However, if no action were the selected alternative for the next 50 -100 years, we could expect populations of forest interior species (such as wood thrush, ovenbird, red-eyed vireo) to increase somewhat as the vegetation matured. We could also expect species such as cavity nesters, woodpeckers, bark gleaners and those needing dead/down woody material (such as pileated woodpecker) to increase as trees develop cavities, die and fall to the forest floor.

Populations of edge or early successional species (such as indigo bunting, blue-winged warbler, prairie warbler, white-eyed vireo) would be expected to decline somewhat as those types of habitat disappeared. In the absence of human-caused vegetation changes, wildlife populations would respond to any changes in vegetation caused by natural events such as fire, windstorm or insect/disease problems.

Alternative 2 and 3:

Forest Plan Standards & Guides

Temporary forage:	Forest Plan = 8-15%
Current=0% [1)]	Alternative 2 = 7% Alternative 3 = 8%

1/ based on 1999-2008 planning period

Creation of 501 acres and 567 acres, respectively, in Alternatives 2 and 3, of temporary forage through regeneration harvest would provide habitat for early successional species represented by the MIS indigo bunting. Other MIS, which would be likely to use these areas, include deer, bobcat, ruffed grouse, turkey and raccoon. After trees are cut, sunlight reaches the ground and there is an immediate response from herbaceous ground flora. Annual and perennial grasses & forbs cover the area, and saplings sprout from the cut oak stumps. Some plants, which have been present, but suppressed, on the forest floor, respond to the sunlight by growing much more vigorously.

These plants provide browse and forage as well as nesting material, nesting sites, escape cover, territorial display areas and resting spots for a variety of wildlife. Although commonly thought of as harboring "common" species such as rabbit, quail, deer and blue jay, these areas also provide the brushy and open conditions needed by some neotropical migrant birds (blue-winged warbler, chat, white-eyed vireo, prairie warbler, etc.).

For much of the next 10 years, there will be about 7% and 8% temporary forage, respectively in Alternatives 2 and 3. Alternative 2 is just below the Forest Plan standard of 8-15% for 4.1 management prescription, while Alternative 3 meets the standards for the management area. In the case of Alternatives 2 & 3, the amount of temporary forage created is above the indicative of viable populations for this habitat component.

Early Successional Gaps: Alternative 2 = 42 acres

Alternative 3 = 68 acres

Small openings (from 1/4 to 2 acres in size) would be created by individual tree and group selection in approximately 10% of the UEAM harvest acres. Within these openings, there will be some forage plants growing up in the small openings created where 2 or more trees were removed. This forage value would last for up to 10 years before the regenerating trees and growing crowns shaded out ground vegetation. Group selection openings are counted toward the regeneration and temporary forage goal, but single tree selection acres are not.

Mast Current=58%; Forest Plan = 30-45%
Alternative 2 = 60%
Alternative 3 = 60%

Mast production would be forgone in the stands proposed for clearcut, seedtree, shelterwood, and within group openings of UEAM harvest until the new stands reached mast-bearing age (somewhere between 40-50 years old). A 501 acre and 567 acre reduction in mast under Alternatives 2 & 3, respectively, would temporarily leave 3804 acres and 3738 acres, respectively, in mast production. These are all above the Forest Plan standard of 30-45% in 4.1. In the next 10 years, an additional 674 acres of oak-hickory will reach mast-bearing age. Adding this to the acres currently 50 years or older and subtracting the acres of temporary forage, there would be 4478 acres (60%) and 4412 acres (60%), in Alternatives 2 and 3, respectively, in mast production within the next 10 years. These are all well above the Forest Plan standard & guide.

Crown closure & ground flora - Alternative 2 = 2295 acres

Alternative 3 = 2234 acres

Commercial thinning, salvage, UEAM harvest, shelterwood removal and shelterwood prep harvests would reduce, but not eliminate, crown closure in the affected stands. After removal of individual trees, the crowns of the remaining trees would utilize the light and nutrients available to increase in size. Therefore, any small openings in the canopy would be gone within approximately 10 years. In UEAM harvest, individual trees or groups of trees may be cut. The small openings created by cutting more than one tree would mimic naturally caused openings from windstorm, fires, and death of individual old trees. They would provide early successional conditions for about 10-15 years until the regenerating trees got tall enough to shade out competing herbaceous vegetation.

Because these stands would remain forested, they would also continue to provide habitat for most forest interior species, represented by the Pileated woodpecker and some neotropical migrant birds, represented by the wood thrush & ovenbird.

Open/Semi-open habitat Current=2%;	Forest Plan = 4-10% Alternative 2 = 4% Alternative 3 = 2%

Open/semi-open habitat would be provided several ways. 34 acres of open fields would be prescribed burned to encourage growth of native warm season grasses and annual and perennial herbaceous vegetation. The 658 acres of oak/pine woodland would be developed through commercial thinning and prescribed burning. A total of 307 acres (4%) of open/semi-open habitat would be provided in Alternative 2, which is within the Forest Plan standard and guide of 4-10% for the 4.1. Alternative 3 would not include the development of the oak/pine woodland and would result in a total of 175 acres (2%) of open/semi-open habitat provided. This is just below the Forest Plan standard & guide of 4-10% for 4.1.

MIS ruffed grouse, bobcat, indigo bunting, turkey, raccoon and deer represent wildlife species, which would benefit from this habitat type. Prescribed burning would create conditions favorable for species which need semi-open habitat or early successional stages (bobcat, indigo bunting, ruffed grouse) or which prefer grasses & herbaceous plants for cover or feeding (turkey, deer). Open woodland conditions, with a less dense overstory of trees and herbaceous ground cover, would provide habitat for indigo bunting. Although not known to exist in the NE Corner Project Area, potential habitat for Bachman's sparrow would also be created through oak-pine woodland restoration.

Old Growth Current= 7%;	Forest Plan = 8-10%; Alternative 2 = 10% Alternative 3 = 10%

Old Growth would be designated on 709 acres and 751 acres in Alternatives 2 & 3, respectively. These meet the Forest Plan standard of 8-10% for 4.1. Wildlife species which would benefit from having this habitat available are represented by MIS Pileated woodpecker, raccoon, & turkey. Species such as cavity nesters, woodpeckers, bark gleaners and those needing dead/down woody material would find more of their preferred habitat in this area as trees develop cavities, die and fall to the forest floor. This habitat component (snags, dead/down woody material) would be less than in Alternative 1 where the entire project area would be allowed to age naturally and no wood products would be removed.

Specialized Habitats
Alternative 2, 3:

There are 8 (eight) known sinkholes within the NE Corner Project Area. Compartment 284, stand 23 contains a sinkhole pond and is scheduled to be prescribed burned in Alternative 2, but has no activity planned in Alternative3. Compartment 287, stand 28 contains a sinkhole pond that will be designated old growth in Alternatives 2 & 3. Compartment 287, stand 38 contains a sinkhole pond. The prescription for this stand calls for commercial thinning in Alternatives 2 and 3. It, and any other sinkholes discovered during activities will be protected by the following mitigation measure:

SW8: There will be no harvest within 50 feet of a sinkhole edge. All other sinkhole ponds known to exist in the NE Corner Project Area have no activities scheduled within the stands under any Alternative.

Marg Pond Natural Area, Compartment 280, Stand 4, is a state designated natural area. This area is protected and will have no activities in Alternative 2 or 3. Adjacent stands will be designated for old growth under Alternatives 2 and 3.

One glade, approximately 0.5 acres in size in Compartment 286.

1829 acres of shortleaf pine forest.

Some of the shortleaf pine forest is proposed for old growth, commercial thinning, uneven-age harvest, clearcut, or prescribed burning. Individual trees would be removed from the harvest stands, leaving more room and nutrients available for the remaining trees. Prescribed burning would topkill some midstory trees leaving a more open understory, which is preferred by accipiters for hunting habitat.

Neotropical Migrant Birds
Alternatives 2 & 3:
See also discussion under Biological Diversity #5.

A concern related to the decline of neotropical migrant birds is the presence of nest predators, such as blue jays, raccoons, and especially cowbirds. Nest predators seem to thrive where different habitat types meet (edge). So while the creation of temporary forage provides habitat for some neotropical migrants, it also provides habitat for species which are a problem for forest interior neotropical migratory birds. Recent research conducted by the North Central Forest Experiment Station has shown that in a primarily forested area, such as the project area, cowbirds are not affecting reproduction of neotropical migrants as much as where forests are heavily fragmented with agricultural land (particularly pasture used by cattle). It appears from this research that the presence of suitable feeding habitat (pastures) is the limiting factor in cowbird population -- and that the edges created by different successional stages of forest are not causing large increases in cowbird population. Research on cowbird and other nest predators is continuing in Missouri.

Of the 3281 acres of private land within the project area, approximately 1566 are forested, 1590 acres are open lands and 125 acres are semi-open according (1999 aerial photos). Many of these open acres are hay/pasture land, most likely fescue. Fescue is a non-native, cool season grass managed almost exclusively for maximum forage production. Much of the private land now in fescue is formerly wooded drainages/slopes. Fescue provides low-quality short-grass habitat, which is used by species such as killdeer, voles, red-tailed hawks and some reptiles. Bats, nighthawks, purple martins, chimney swifts & swallows might use these areas when foraging for insects.

The forage value of fescue is questionable since the majority contains the fescue fungus. In addition, there is little plant diversity in fescue fields. The value of this type habitat as cover or breeding area is minimal for most species since there is very little structural diversity and most of the brushy fencerows have been cleared out so the grass goes right to the fence. In 1986, acres of private land within the project area consisted of approximately 1438 acres forested, 1605 acres of open lands and 238 of semi-open lands.

Very little change occurred on private lands within the NE Corner Project Area from 1986 to 1999. In 1999 there was an increase of 128 acres of forested lands and a decrease in both open and semi-open lands of 15 acres and 113 acres, respectively. From this information, there does not appear to be any major changes on private lands and limited conversion of forested lands to open pasture. Although it is impossible to predict what changes might occur on private land, it is likely that hay/pasture and similar land use will continue. If cattle are grazing this open land, it would provide suitable feeding habitat for cowbirds. Most of the project's National Forest System land is well within the traveling range of cowbirds, which might be feeding on adjacent private land. In order to minimize potential cowbird perches (from which cowbird females watch for host birds returning to their nests), the following mitigating measure would be used in Alternative 2:

WL2: In all even-aged harvests (clearcut, seedtree and shelterwood seedcut), reserve trees should be left in groups of at least 5 or more trees where possible. Snags should not be left standing alone within the cut area, but should be surrounded by several live trees.

Other Actions
Alternative 2, 3:

Road reconstruction and or improvement work, use & maintenance of temporary roads, construction of log landings and use of skid trails may damage or destroy some burrows or vegetative cover for small mammals, reptiles and amphibians, some birds and invertebrates. Because the areas are small and scattered, populations of any of these species are very unlikely to change in the short or long term.

TABLE 6
Summary of Wildlife Habitat Effects (Project Area)

Habitat Condition	Existing	4.1 Forest Plan S&Gs	Min. Viable	Alt 1	Alt 2	Alt 3
Temporary forage	0%	8-15%	4%	Stay the same	7%	8%
Mast production	58%	30-45%	25%	increase	60%	60%
Open/Semi-open	2%	4-10%	1%	decline	4%	2%
Old Growth	7%	8-10%	5%	increase	10%	10%
Special Habitats						
Shortleaf Pine	1829 ac	Manage	N/A	Grow old	Some harvest/burning	

Marg Pond Natural Area	1	OG	N/A	protect	OG	OG
Sinkhole Ponds	8	N/A	no action	no action	OG, no action, CT	OG, no action, CT
Glade	0.5 acres	Min %, emph. on glades > 10 ac	N/A	no action	CCN	CCN
Neotropical migratory birds						
Forest Interior				Increase	Stay the Same	Stay the Same
Early Successional				Decrease	Increase	Stay the Same

*1999 – 2008 planning year
Minimum Viable = Habitat objective indicative of minimum viable populations of MIS
OG = designated Old Growth
CCN = Clearcut with Natural Regeneration
CT = Commercial Thinning

Cumulative Effects

General Wildlife/Management Indicator Species (MIS)/Threatened/Endangered/Sensitive Species

The area considered for cumulative effects is the 4.1-12 Management Area within predominantly in the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA. Each species requires a different scale of habitat to meet its needs. Most species found in the NE Corner Project Area are also found on other parts of the District and Forest. Land Type Associations are areas of generally similar topography, soils and vegetation types, and is the basis for analyzing cumulative effects on wildlife.

The time period considered for cumulative effects is the next 10 years (the time period we can reasonably expect to influence wildlife with this project). National Forest projects that have occurred in the past 20 years in this area are commercial timber sales with varying types of harvest, prescribed burns, wildfire, wildlife waterhole construction and maintenance, road maintenance and reconstruction, and precommercial thinning. Reasonably forseeable actions within the area include prescribed burns under previously completed NEPA decisions, wildfire, and road maintenance. There are no other vegetation management projects currently being planned for the this management.

During the next decade, private landowners will determine land uses on about 30% of these LTA's (the amount of private land in the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA]. Oak-Pine Breaks and Oak-Pine Hills LTA's). Current land uses on private ownerships include homes, farms, forest, and small businesses. Private lands are a mixture of open pastures, developed areas, and some forest. Private forests may or may not be managed by the landowners. Past trends on private land are toward an increase in fescue pastures and developed areas. If these trends continue, it is likely that there will be less forest on private ownerships at the end of this decade, and more openland or developed land. These uses are unlikely to change substantially in the next decade.

National forest lands within the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA will be managed to maintain a variety of forest age classes, sizes, structures, and native species. Special habitats (glades, springs, seeps, fens, wetlands, riparian corridors, shortleaf pine forest, bottomland hardwood forest, caves, and sinkholes) will be protected and managed as needed to maintain the unique qualities of these areas.

Federal Species: The Forest Service is legally required to provide protection to insure survival of federally listed species. A Biological Evaluation (BE) for these species was conducted. There were no federal species documented as occurring in the project area. There is no critical habitat for any federal species in this project area, or on the Mark Twain National Forest. The BE discusses potential effects to federal species which could possibly occur in the area or that the project potentially affects and concludes that there would be no additional effects beyond those discussed and evaluated in the 1998 programmatic Biological Assessment and 1999 programmatic Biological Opinion. The BE also determined that the activities proposed in the NE Corner Projects Area (for all alternatives) comply with the Reasonable and Prudent Measures and Terms and Conditions of the June 23, 1999 US Fish and Wildlife Service's Biological Opinion.

Eastern Region Sensitive Species: There are 2 ERSS documented to occur in the NE Corner Projects Area (2 plants). There would be no direct effects to these species from activities proposed in any of the alternatives. There would be no indirect effects to potential habitat for 18 Eastern Region Sensitive Species in the NE Corner Projects Area, and therefore No Impact to any of the ERSS species evaluated.

The cumulative effect of private land uses and national forest management within the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S)] LTA's over the next decade is that about 70% of the area will be in various forest successional stages and about 30% will be open/developed lands. Habitat for Eastern Region Sensitive Species will be available in approximately the same amount and distribution as currently exists. Viability of any of these species would not be affected either in the short or long-term.

MIS and General Wildlife: Alternative 1, when added to past and future activities and their effects, would result eventually in a shift towards species preferring mature/old growth forest or closed canopy forest within the project area and the 4.1-12 MA. However, that shift would probably not occur within the next 10 years. Populations within the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA] LTA's would probably not show much change since the project area is only about 7% of this LTA.

Alternatives 2 and 3 when added to past and future activities and their effects, would not have an appreciable cumulative effect on wildlife populations within the project area, 4.1-12 MA, or the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA]. Oak-Pine River Breaks and Oak-Pine Hills LTA's. Temporary as well as permanent changes in number and distribution of animal populations have occurred in the past due to land clearing, wildlife, vegetation changes, road building, and other activities. The activities proposed within these alternatives, together with the reasonably foreseeable activities, would maintain vegetative conditions similar to existing conditions. Therefore, while short-term population fluctuations might be expected for some species, long-term population trends are not likely to change and there is not likely to be any affect on viability of any species local or regional population.

A primarily forested landscape would be maintained. No conversion of National Forest to permanent agriculture or other non-forest would occur. Therefore, interactions between forest interior birds and nest parasites/predators would not be exacerbated by activities proposed in this project area. North Central Forest Experiment Station and others are conducting studies to determine the specific causes for population declines documented for some species.

Aquatic Communities & Recreational Fisheries

Fish And Other Aquatic Species - Existing Condition

In the revised edition of "The Fishes of Missouri" dated 1997, William L. Pflieger described four aquatic faunal regions: the Prairie, Ozark, Lowland, and Big River. The NE Corner project lies within the Ozark region. In January 2003, the Missouri Department of Conservation (MDC) completed the "Current River Watershed Inventory and Assessment". The NE Corner project lies within this watershed. Sycamore Creek (4^{th} order stream) and Pike Creek (5^{th} order stream) are the two major drainages in the NE Corner Project area. Both Sycamore and Pike Creek are intermittent, seasonally dry, warmwater, with 7-day, 2-year low flow known to be less than 1 cfs, and losing (MTNF, AECS). The Forest Fisheries Biologist conducted a field review on August 11, 2003, and found the Pike Creek and Sycamore Creek stream beds to be void of water, except for a small pool where Pike Creek and county road 568 cross in T27N, R3W, Section 23. Within the project area, there exist along Pike Creek a ¼ mile reach which boarders NF land, the remaining 6+ miles of Pike Creek within the project area is boarded by private lands. Sycamore Creek flows into Pike Creek and except for a 2 mile reach in the upper end, near Highway 19, the remaining 4+ miles of Sycamore Creek is boarded by private lands. Pike Creek and Sycamore Creek appear to lose nearly 100% of their surface water and go completely dry during the summer. There are no MDC fish sampling sites within the NE Corner Project area. With no perennial streams in the Project area, the opportunity for fish and crayfish to exist is limited to the short time frame, perhaps during flash flood events, when water is present.

Direct and Indirect Effects on Fish and other aquatic species
Direct & Indirect Effects Common to all Alternatives

Goals for the MTNF Fisheries Program can be found IV – 2 & 3 of the LRMP. The primary fisheries goals for the MTNF are to Protect Aquatic ecosystems, Restore degraded aquatic ecosystems and Enhance Aquatic Resources User Opportunities. Forest-Wide Standards and Guidelines for the MTNF Fisheries Program can be found on Pages IV – 49 & 49 of the LRMP. These are specific Forest-Wide Standards and Guidelines which apply to streams, lakes, and ponds.

A Biological Evaluation (BE) for Federal listed species was completed and is located in Project File. Site-specific effects determinations for each species are summarized in this document. The BE discusses direct and indirect effects to Federal listed aquatic species and concludes that there will be no effects outside those evaluated in the programmatic Biological Assessment and Biological Opinion. The USDA Forest Service Eastern Region Sensitive Species (RFSS) BE is also located in the Project File. The RFSS BE concluded there would be no direct or indirect effects to R-9 listed aquatic species.

Pike Creek and Sycamore Creek appear to lose nearly 100% of their surface water and go completely dry during the summer. With no perennial streams in the Project area, the opportunity for fish and crayfish to exist is limited to the short time frame, perhaps during flash flood events, when water is present.

Alternative 1: No Action

In this alternative current and on-going activities would continue, but no new management activities would be initiated. Siltation tops the list of the foremost 10 pollutants in rivers, half-again higher than the 2nd most important pollutant, nutrients. Over a 10-year period, Non-Point source contaminants of non-system roads (approximately 13+ miles) could contribute to the amount of sediment near Plum Springs, Mill Creek Spring and Big Springs. These non-system roads within the project area would remain open under this alternative. Over this 10-year period, the amount of sediment entering stream water courses would most likely increase; however, it is doubtful this action by itself would cause changes to water quality which would impair MDNR designated uses, including the cool water fisheries associated with Big Spring and the Current River near Van Buren.

Alternative 2: Proposed Action

This alternative moves the project area towards long term wildlife habitat goals by providing 503 acres of early successional temporary forage habitat through clearcutting, shelterwood seed cutting, seed tree cutting, and uneven-aged management-group selection cutting, and 34 acres of open land habitat and 658 acres of pine woodland conditions through burning. Reconstruct approximately 12 miles of system roads and maintain another estimated 10 miles of system roads to provide a safe and maintained running surface; Close approximately 13 miles of non-system roads; Construct approximately 5 miles of temporary roads and use 9 miles of unclassified road needed for management access and Close the same 14 miles immediately after the temporary/unclassified road has served its purpose; and Designate an estimated 31 miles of skid trail locations to provide consideration of this impact to the environmental analysis.

Pike and Sycamore creeks are known to lose water and dye traces indicate this ground water travels outside the Project area to re-appears near Plum Springs, Mill Creek Spring and Big Springs. Following a timber harvest, suspended solid concentrations increase significantly during peak stormflow events; however, it takes relatively high suspended solid levels in excess of 20,000 mg per liter to cause behavioral reactions in most fish species. Use of BMP's can reduce levels of suspended solids as vegetation re-establishes after commercial harvest activities; therefore, commercial harvest activities will not adversely affect beneficial water uses, including the "cool water fisheries" associated with Big Spring and the Current River.

The proposed prescribed burned, viewed at the right scale of time and space, would not have a negative impact on aquatic biotic. A patchy burned landscape, burned outside the high resource damage period (October 11 – April 9), would result in a low intensity fire, would not burn down to mineral soil and would not contribute to the sediment load of Plum Springs, Mill Creek Spring and Big Spring.

Alternative 3:

Alternative 3 has similar acreage to be managed as does Alternative 2, similar amount of road construction, maintenance, and closures. This is essentially the same as Alternative 2 with the following change which responds to a concern over the amount of burning in the Proposed Action. The 658-acre prescribe burn is dropped in this alternative; however a 34-acre open land burn in C-282, stands 52 and 53 remains a part of this alternative.

As in Alternative 2, the primary concern is how roads accelerated the delivery of sediment to the ground water system. In this alternative, fewer acres are harvested, thus the need for fewer roads. Non-Point source contaminants from road construction activities are not significant enough to have an adverse effect on aquatic biotic, so long as BMP and mitigation measure are implemented.

The proposed 658-acre landscape prescribed burned is omitted in this alternative; however, the 34-acre open land burn remains a part of this alternative. Of primary concern is how the fire accelerates the delivery of sediment to the ground water system. All prescribe burn concerns expressed in Alternative 2 would apply for this alternative.

Cumulative Effects:

The area considered for cumulative effects is Pike Creek, Sycamore Creek, Plum Springs, Mill Creek Spring and Big Springs. The time period considered for cumulative effects is the next 10 years.

Pike Creek and Sycamore Creek appear to lose nearly 100% of their surface water and go completely dry during the summer. With no perennial streams in the Project area, the opportunity for fish and crayfish to exist is limited to the short time frame, perhaps during flash flood events, when water is present.

Direct, Indirect Cumulative Effects on Aquatic Communities & Recreational Fisheries

With BMP and proposed S&W mitigation measures implemented, none of the actions proposed in the alternatives would have a direct, indirect, or cumulative negative affect on fisheries within and outside of the Project area.

Because the project area is at least 11 miles from the Current River, and because there would be a large amount of undisturbed forest ground cover between any project activities and drainages leading to the river, any soil moving from areas affected by management would be caught in the leaf litter and would not reach permanent waterways. Therefore, adequate fish passage and water flow would be unaffected by implementation of projects in these alternatives. No point or non-point source pollution would enter the river because all intermittent drainages would remain in a forested condition. In addition, all management practices would follow Forest Plan guidelines and mitigating measures described in this analysis to reduce the potential for soil movement. Since there would be no change to water quality as a result of these alternatives, composition of the fish populations and fishing opportunities in the Current River would not change.

Mitigation

Nearly 90 percent of the erosion from timber harvesting can be traced to the logging road system. The Best Management Practices (BMP) as described in Thomas F. Waters' Monograph 7 "Sediment in Streams", page127, "Methods for the reduction of erosion from logging roads" will be utilized in designing the logging road system (a description of the various methods Waters described can be found in the Project File).

Impacts from any action alternative would be indirect and non-significant provided those recommended mitigation measures SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10 SW11, SW12, SW13, and SW14 on page 29-30 and the standard and guides in the Forest Plan are followed.

Monitoring:

Project level monitoring is designed to determine whether or not the resource management objectives of the environmental analysis have been implemented as specified and whether or not the measures for mitigating the environmental effects were effective.

Implementation monitoring of project recommended mitigation measures and other project actions would be conducted by the project administrator.

Forest-wide project implementation audits would be conducted by Forest resource staff on a sample of randomly selected project areas on an annual basis. The NE Corner project area could be included in this sample at any time and at any stage of the project planning and implementation process.

Vegetation

Current Conditions:

The project area is located predominantly in the Current River Pine-Oak Woodland Dissected Plain Landtype Association (LTA) [formerly the Oak-Pine Hills (OPH) Sandstone (S) LTA and the Oak-Pine Breaks (OPB) Sandstone (S) LTA]. Ecological landtypes (ELTs) associated with this LTA in the project area include:

ELTs	Table #7	Acres
3	High floodplain/low terrace	28
4	Upland waterway	51
5	Upland waterway	410
6	Upland waterway	379
10	Ridge	3
11	Ridge	410
14	Flat	229
15	Flat	1111
17	Side slopes, south and west aspect	2770
18	Side slopes, north and east aspect	2020

Descriptions of the natural plant communities associated with these ELTs are found on pp. 34-52 of the Mark Twain National Forest Terrestrial Ecological Classification System (TECS). Standards and Guides for Vegetative Management on pp. IV-13-17 of the Mark Twain National Forest Land and Resource Management Plan (Forest Plan) incorporate this ecological classification system in the description of natural vegetation communities. ELT/Natural Plant Community/Dominant plants present in the project area are shown in the Table #8 below:

Table #8 ELT	Natural Plant Community(ies)	Dominant Plants
3	Mesic bottomland forest (1)	sugar maple, bitternut hickory, hackberry, white oak.
4	Gravel wash (10)	none listed
5	Dry bottomland forest (9)	elm, chinkapin oak, hickory, white oak, hackberry, blackgum
6	Dry-mesic bottomland forest (8)	white oak, shagbark hickory, shumard oak, blackgum, black cherry
10/14	Xeric chert forest (23)	post oak, black oak, shortleaf pine, highbush Blueberry, goat's rue
11/15/17	Dry chert forest (19, 20, 21)	white oak, scarlet oak, black oak, shortleaf pine, flowering dogwood, lowbush blueberry.
18	Dry-mesic chert forest (15)	white oak, northern red oak, black oak, blackgum, flowering dogwood, Virginia creeper

A Summary Of Current Vegetative Conditions (As Of July, 2003) In The Project Area

a. Productivity, Condition and Age:

Table #9 below shows 238 acres are not suitable for timber management based on site indices <50.

Condition Class	Acres		Age-class	Percent
High Risk	226		0- 9 yrs	0.0%
Sparse	94		10- 19 yrs.	5.8%
Low Quality	385		20- 29 yrs	5.2%
Mature	643		30- 39 yrs.	4.8%
Immature	4839		40- 49 yrs.	10.6%
Uneven-aged	145		50- 59 yrs.	14.4%
Two-aged	821		60- 69 yrs.	27.3%
In process of regeneration	90		70- 79 yrs.	18.6%
			80- 89 yrs.	6.2%
			90- 99 yrs.	2.9%
			100-109 yrs.	1.2%
			110-119 yrs.	0.4%

Chart #1

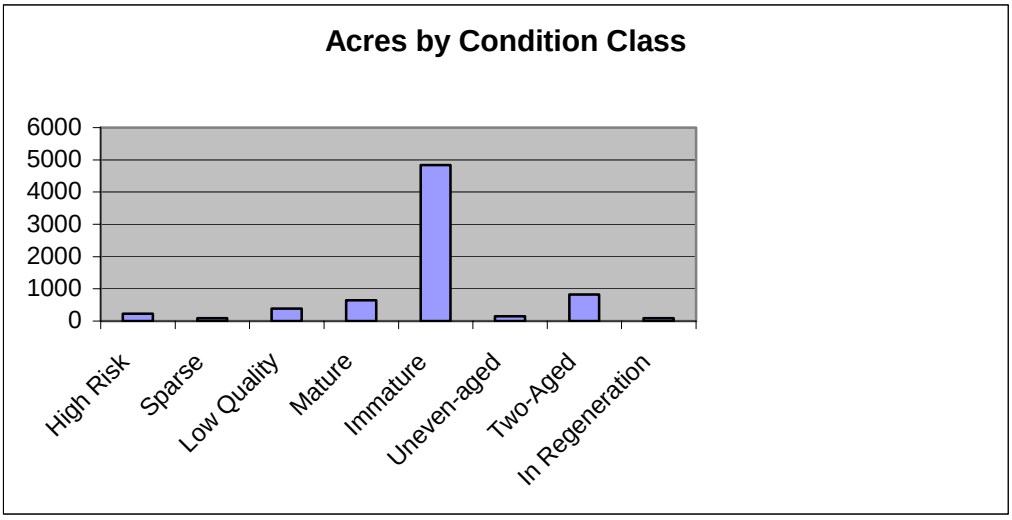
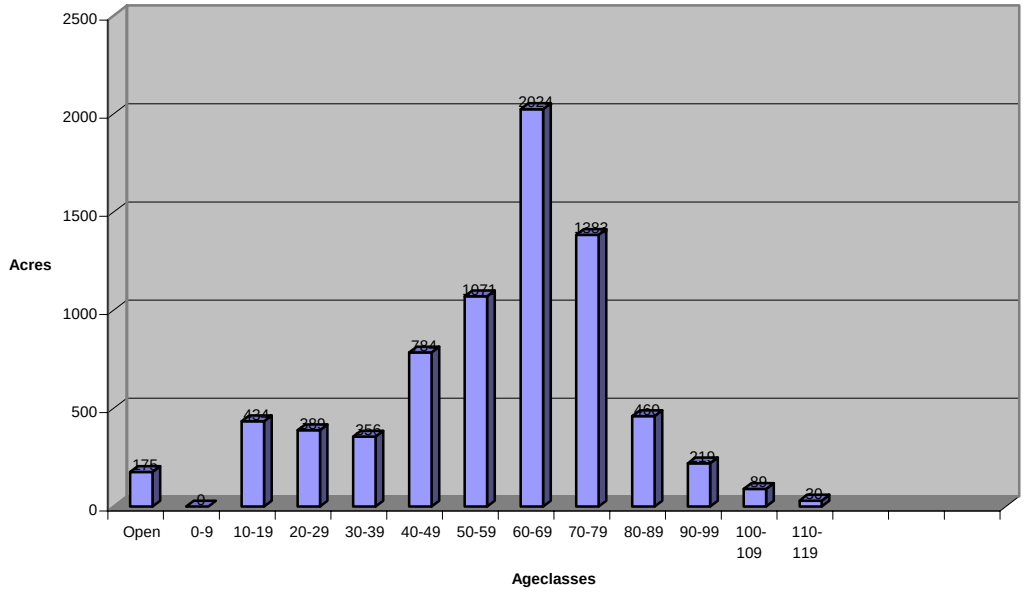


Chart #2: Current Condition - Ageclass Distribution



b. Threatened/Endangered/Candidate/Sensitive Species:

There are no documented locations of federal threatened or endangered (TE) plant species in the Northeast Corner Project Area. There is no designated critical habitat for any federal TE plant species in the Northeast Corner Project Area, the Doniphan/Eleven Point District, or the Mark Twain National Forest. According to The Missouri Heritage Database two Regional Forester Sensitive Species (RFSS) plants have documented occurrences in this project area, although fifteen RFSS plants have potential suitable habitat. There is no essential habitat, whether occupied or unoccupied, for any RFSS plants in the Northeast Corner Project Area. No state endangered plants are known or likely to occur in Shannon and/or Carter counties within the Current River watershed, and there are no documented occurrences of any state endangered plant species found within the Northeast Corner Project Area based on a review of the Missouri Heritage Database.

c. Oak-hickory, and pine components:

Table #10: Tree species composition in the project area:

Forest Type	Acres	Percent
Pine	1829	25
Oak-pine	2563	35
Post/blackjack Oak	71	1
Black/scarlet Oak, Hickory	1053	14
White Oak	159	2
Scarlet Oak	124	2
Mixed Oak	1440	19
Upland brush	35	<1
Open lands	140	2

Oak regeneration requires enough light to initiate germination and to continue development of a root system. Eventually young oaks successfully compete with other tree species when sufficient light permits rapid shoot growth. Rapid shoot growth seldom occurs unless the overstory is substantially reduced in density (Johnson 1979, Johnson 1941) through events such as fire, windthrow, mortality, defoliation, drought, and timber harvesting (Johnson 1993). Successful regeneration of oak depends a great deal on the presence of adequate advance oak regeneration and/or sprout potential. Research and observation indicate that the drier ecosystems of the Ozark Plateau are often self-sustaining (oak reproduction naturally accumulates in the understory) and can be successfully regenerated by timber harvesting (Johnson, 1993).

The shortleaf pine forest community on the Mark Twain National Forest is at the northern edge of its range and achieves its optimum growth rate here. Prior to modern settlement, this community developed and was maintained by natural and human-caused disturbances, most noteably wildfire which exposed suitable seedbeds and reduced competition from hardwoods (Final Environmental Impact Statement, Pineknot Woodland Restoration, 2003). On many Ozark forest sites, available soil moisture determines which species prevails. Pine is more drought resistant than most hardwoods and consequently competes better on ridgetops, upper slopes, and south and west exposures which dry out faster (Brinkman and Smith, 1968). Shortleaf pine can be established where seedtrees and suitable seedbeds (leaf litter disturbed by harvest operations or reduced by prescribed fire) are present, or it can be planted (Brinkman and Smith, 1968).

d. Herbaceous understory:

Pages 35-47 of the TECS display the understory species composition likely to be found on the ELTs in the project area.

The current extent, cover, distribution, and occurrence of herbaceous ground cover is dependent on whether a particular stand has been burned (either prescribed or wildfire), when the stand was last harvested and by what method, and its past grazing history. However, the common factors affecting the overall reduction in ground cover as compared to what existed on-site pre-logging boom (prior to late 1800's) is twofold: first, the amount and density of overstory shading; second, the accumulation of heavy leaf litter that smother these otherwise sun-loving plant species (Final Environmental Impact Statement, Pineknot Woodland Restoration, 2003).

e. Private Land:

There are approximately 3,281 acres of private land in the project area. Aerial photographs taken in 1999 indicate the following vegetative conditions:

Category	Percentage	Acres
Open land	48	1,590
Forested	48	1,566
Semi-open	4	125

Direct and Indirect Effects

Effects on Threatened/Endangered/Candidate/Sensitive Plant Species

There are no direct or indirect effects on federal TE plant species because there are no documented locations of these species nor is there designated critical habitat for these species in the Northeast Corner Project Area. There are no direct or indirect effects on any RFSS because the only documented occurrences of RFSS are within a designated State Natural Area where no activities are proposed. There are no direct or indirect effects on state endangered plants because none are known or likely to occur in Shannon and/or Carter counties within the Current River watershed, and there are no documented occurrences of any state endangered plant species found within the Northeast Corner Project Area based on a review of the Missouri Heritage Database. The project area does contain potential suitable habitat for some RFSS and the Biological Evaluation discusses the effects of the proposed action on affected species or their occupied habitat.

Effects on Other Vegetation

Activities proposed in Alternatives 2 and 3 include regeneration and intermediate harvest methods utilizing both even-aged and uneven-aged silvicultural systems. Even-aged management is appropriate to ensure regeneration and growth of shade-intolerant species such as oak and pine, and to meet the objectives of the Mark Twain National Forest Land and Resource Management Plan for the 4.1 Management Prescription (p.IV-37, pp.IV-125-132, and Appendix D).

Alternative 1(No Action): Implementing the no action alternative would not alter the continued growth or decline of existing vegetation.

Black and scarlet oak trees in stands classified as high risk would continue to decline and die. These trees would not be used for wood products but would be left to decompose naturally. Some stands classified as high-risk, low quality or mature would develop old growth characteristics. ***Five hundred fifty-two (552) acres of old growth*** are currently designated in the project area and this designation would not change under Alternative 1. Stands classified as low quality would move into the high risk category and immature stands would begin to move into the mature or low quality condition classes. Due to their growth characteristics and reproductive habits, the amount of pine, post oak, white oak, and hickory would increase in the stands and black and scarlet oaks would decrease.

The age class distribution resulting from implementation of Alternative 1 would be the same as the distribution shown above under Current Conditions. There is currently ***no 0-9 year age class habitat.*** Any development of this habitat would be the result of wildfire, storm or insect activity of a scale (at least stand-size) and intensity to significantly alter canopy closure.

With respect to the oak-hickory and pine forest communities, this alternative would not significantly change the existing composition in this planning period or perhaps the next. A continued regime of no disturbance would result in an increase in shade-tolerant species (predominantly red maple and dogwood) and a decline of intolerant species (predominantly scarlet and black oak) on more mesic sites. More xeric sites would likely continue to be dominated by oak-hickory and pine.

In the absence of a significant natural disturbance event, the herbaceous understory would not change significantly this planning period and perhaps the next. Over time, as the canopies of older timber stands become more open due to decline and mortality of overstory trees, herbaceous cover would increase in openings, then decrease as tree canopies close.

One hundred seventy-five (175) acres of open/semi-open habitat currently exist in the project area. The amount of this habitat would not significantly change this plan period but would diminish in the near future under a no disturbance management regime.

Alternative 2: ***Approximately 34 acres*** of existing open land would be maintained by ***prescribed burning.***

The stands proposed as ***old growth (approximately 157 acres for a total of 709 acres)*** would not be entered for timber harvesting or habitat improvement work and thus naturally move through stages of maturity, decline, death, decomposition, and regeneration. In bottomland and riparian areas (ELT 3), the oak component would likely decrease as black/scarlet oak mature and die, although a small component of white or chinkapin oak would likely remain. Ash, sycamore, hickory, hackberry, blackgum and elm would likely remain or become the dominant species.

On more mesic upland sites (north and east slopes – ELT 18), shade tolerant species such as maple and dogwood would increase and the oak-hickory component would gradually decrease as decline and mortality remove black/scarlet oak. White oak, where currently present, would likely remain a component on these sites. The remainder of the potential old growth would be designated on more xeric sites (ridges, flats, south and west slopes - ELTs 10, 11, 14, 15 and 17) where oak-hickory and pine would remain a significant components of the overstory.

Changes in climate conditions in the perimeter of stands adjacent to even-age regeneration cuts (increased sunlight, lower humidities, increased evapotranspiration, i.e. a general decrease in shaded/more moist conditions associated with interior forest) would occur under this alternative. Some change in climate conditions would occur in the perimeter of proposed old growth stands adjacent to even-aged commercial thinning activities, i.e. generally some decrease in shade/moisture from that found in interior forest until canopies in the harvested stands close. Herbaceous cover would remain relatively low until the overstory canopy opens as trees die, at which time herbaceous cover would increase.

Clearcutting with reserves would be implemented on approximately ***338 acres*** in Compartment 281, stand 1, Compartment 282, stands 5, 54, 78, 79 and 84, Compartment 283, stands 28, 37, 42, 56, 59, 63, 66, 72 and 76, Compartment 284, stands 6, 12 and 57, Compartment 285, stand 44, Compartment 286, stand 27, and Compartment 287, stands 54, 69, 80 and 81. A significant component of mature, low quality or high-risk black and scarlet oak, along with the absence of sufficient numbers of trees of other species to maintain shelterwood or seedtree overstories and the need to utilize existing coppice (stump sprouting) potential and advanced regeneration to regenerate these sites favor clearcutting as the optimum method of regeneration and production of woodland habitat in the 0-9 year age class. Clearcutting would involve the removal of all overstory trees with the exception of at least 15 sq. ft. of basal area of reserve trees grouped or retained around large snags, large live trees, den trees, and within intermittent drainages. Reserve trees would be composed primarily of white oak, post oak, hickory, black oak or pine. Den trees, and some snags and fruit-bearing trees would also be retained. Shortleaf pine seedlings would be ***planted*** following clearcutting on approximately ***167 acres.***

The year following planting, all understory trees, with the exception of some fruiting/flowering species, would also be cut to stimulate sprouting and to ***release*** pine seedlings from hardwood competition. This would allow the pine seedlings to become established and better compete with the hardwood sprouts. Immediately following harvesting in the clearcut areas not being planted (approximately ***171 acres***), all understory trees with the exception of some fruiting/flowering species would be cut to stimulate sprouting ***(site preparation for natural regeneration).*** Within three to five years, clearcut areas would be fully stocked with oak-hickory and/or pine saplings.

Under this alternative, ***shelterwood seed cutting*** would occur on approximately ***33 acres***, and ***seed tree seed cutting*** would occur on approximately ***88 acres*** resulting in 121 acres of oak/hickory/pine regeneration. In stands where shelterwood seed cutting is proposed, a minimum of 25 sq. ft. of basal area of overstory white oak, pine, hickory and some black and scarlet oak trees would comprise the shelterwoods in these stands and would be grouped or retained around large snags, large live trees, den trees, and within intermittent drainages. Pine would be a significant component of the shelterwood in Compartment 282, stand 4. Oak would be the predominant shelterwood species (although pine, where present, would also be a component) in Compartment 283, stand 36. In the seed tree seed cuts all of the overstory trees, and most understory trees, would be removed except for pine seed trees and other species left to maintain at least 15 sq. ft. of overstory basal area grouped or retained around large snags, large live trees, den trees, and within intermittent drainages. Shortleaf pine seedlings would be ***planted*** following seed tree seed cutting on approximately ***22 acres.*** The year following planting, all understory trees, with the exception of some fruiting/flowering species, would also be cut to stimulate sprouting and to ***release*** pine seedlings from hardwood competition. This would allow the pine seedlings to become established and better compete with the hardwood sprouts. Shelterwood seedcutting and seed tree cutting in these even-aged stands of mature oak-hickory, oak-pine and pine would encourage oak-hickory and oak-pine regeneration and produce woodland habitat in the 0-9 year age class. These methods of even-aged management are appropriate because existing oak-hickory seedlings would be released to grow in response to increased light, new oak-hickory trees would develop following cutting to generate sprouts (site preparation for natural regeneration), and because current overstory conditions (age, structure and/or species composition) would not support development or maintenance of uneven-age structure. Existing pine seedlings would also grow in response to the increase in light in these stands, and new seedlings would become established where disturbance of the leaf litter exposes bare soil. Herbaceous cover would increase significantly following harvesting and remain a significant component of these sites until the canopy of new trees begins to close.

Shelterwood preparatory cutting would focus on preparing four mature, even-aged stands (approximately **57 acres**) for the establishment of new oak-hickory and pine seedlings and stimulating the growth of existing seedlings by increasing light to the forest floor through the removal of low quality or declining black and scarlet oak, and low quality and some mature pine, and by exposing some soil during harvest operations. All of the stands would remain in a high-canopy forested condition (retaining approximately 50 basal area of overstory trees) with pine dominating the shelterwood in two stands and being a significant component, along with various species of oak, in the other two stands. Hickory, where it currently exists, would also be a component of these shelterwoods. Shelterwood preparatory cutting in these stands is appropriate because current overstory conditions (age, structure and/or species composition) would not sustain uneven-age structure. The growth of existing oak and pine seedlings would be stimulated, as would the growth of herbaceous cover, by the increase in light reaching the forest floor.

Where ***salvage cuts*** (approximately ***114 acres***) are proposed, some reduction of the overstory canopy would occur and some gaps/openings would occur where groups of dead/declining trees are removed, but overall the stands would remain in a high-canopy, forested condition. These cuts would focus on removing the highest risk/poorest quality red oak (black and scarlet oak) from even-aged stands due to the incidence of decline/mortality or red oak borer infestation within this species group. White oak, post oak, hickory, occasional pine, and the most vigorous red oak would comprise the residual stands. Salvage cutting would retain the oak-hickory component, and in general, stimulate existing seedlings/saplings as light increases where overstory trees are removed. Herbaceous cover would also show some increase. Salvage cutting is appropriate because the ages and species composition of these stands would not sustain uneven-age management.

Commercial thinning (approximately ***1660 acres***) under this alternative would focus primarily on reducing the number of trees in heavily stocked (in some cases, overstocked) even-aged stands of oak-hickory and pine. Suppressed, poorly formed or excess trees (trees not needed to maintain full stocking) would be removed and utilized as posts, poles and sawtimber. Well-formed, dominant and codominant trees would exist in a more open but well-stocked (approximately 80-90 basal area) condition following harvest. Increased light reaching the forest floor would stimulate the growth of existing oak seedlings, and the growth of herbaceous cover would likely be stimulated as well. Thinning in a number of even-aged oak-pine stands would focus on removing low quality or declining oak as well as removing suppressed, poorly formed or excess pine. In the even-aged oak stands proposed for thinning, poorer quality or declining black and scarlet oak would be the focus of removal. More vigorous oak would exist in a more open but adequately-stocked condition. Herbaceous cover would likely show some increase following commercial thinning in these stands. Commercial thinning is appropriate in these stands in order to improve or maintain growth and utilize volume which may be lost, and because current stand structures, ages and/or species composition may not support development or maintenance of uneven-age conditions.

Under this alternative, ***uneven-aged management group selection (group openings)*** would be implemented on ***approximately 42 acres*** in conjunction ***with improvement cutting (commercial thinning between group openings)*** *on* ***approximately 389 acres*** in thirty-four stands, and would result in some change in species composition and structure, with the removal of primarily larger diameter, lower quality and/or declining black and scarlet oak, and occasional lower quality or mature white oak and post oak. White oak, pine, and hickory would be the predominant species following harvesting, along with more vigorous (generally younger) black and scarlet oak. Where groups of lower quality or declining trees occur in conjunction with advance oak regeneration, ***group openings*** (group selection) between one-third acre to two acres in size would be created by harvesting all commercial-size trees followed by non-commercially cutting all residual trees in the groups to release existing oak-hickory and pine seedlings or promote sprouting of oak-hickory, consequently, an additional ***42 acres*** of oak/hickory/pine regeneration would be anticipated from group cuts. A combination of ***non-commercial timber stand improvement/reforestation cutting*** would also occur following harvesting on ***approximately 389 acres*** between group openings to further develop uneven-age structure and oak regeneration by removing damaged, low quality or excess trees in diameter classes smaller than 9”.

Overall, the stands would remain in an adequately-stocked (approximately 60 basal area), high-canopy, forested condition, but would also display characteristics of clearcuts in the group openings. The response of herbaceous cover would be similar to that resulting from salvage cutting, except in group openings where herbaceous cover would likely increase significantly and remain a significant component until the canopy of new trees begins to close.

Precommercial thinning (approximately 439 acres) would reduce the competition among trees in heavily stocked stands of sapling-size oak, oak-pine and pine. Oak, pine, and hickory would be the favored species to retain. The canopy would generally remain in a closed condition although some increase in light to the forest floor would maintain some level of herbaceous cover.

Pine woodland development would be initiated on approximately ***658 acres*** by ***commercially thinning*** approximately ***478 acres*** to reduce residual stand densities to approximately 60 basal area through the removal of higher-risk or lower quality oak (primarily black and scarlet oak) and lower quality or excess pine. Following commercial harvest activities, ***prescribed burning*** would be conducted on approximately ***658 acres*** to reduce understory densities and to stimulate grass and herbaceous ground cover. Residual stands would contain more widely-spaced, larger diameter oak and pine overstories associated with open understories, and with repeated burning, grass and herbaceous ground cover. An additional 132 acres of semi-open habitat is anticipated from pine woodland development activities for a total of 307 acres in the project area.

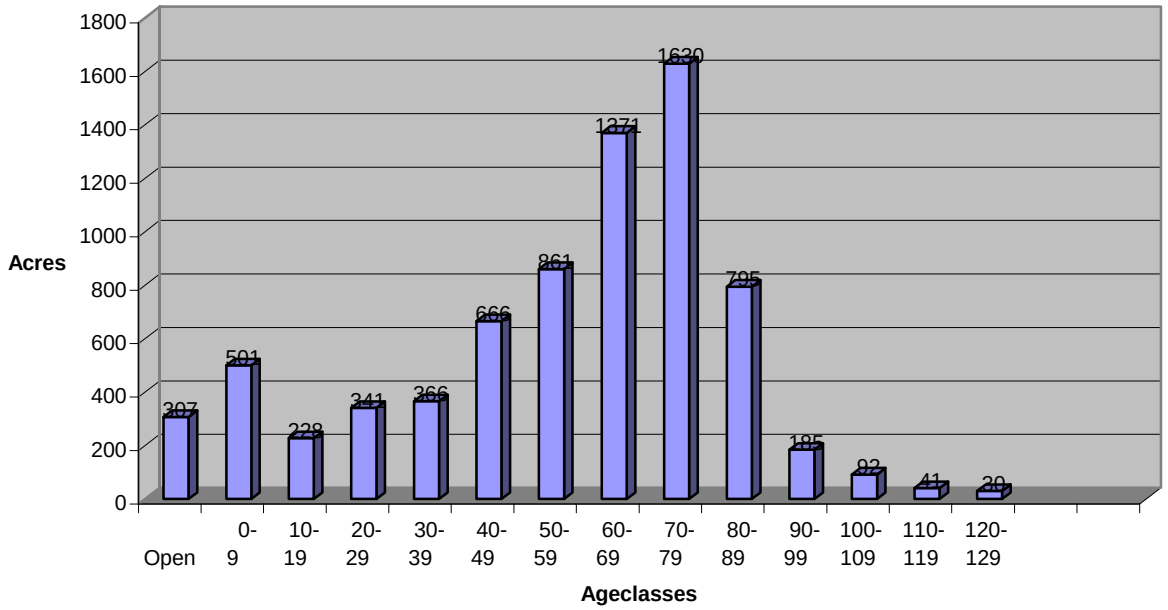
The following age-class distribution would result from implementing Alternative 2:

Table #12:
Age-class distribution

Age-class	Percentage
0-9 yrs.	6.8%
10-19 yrs.	3.1%
20-29 yrs.	4.6%
30-39 yrs.	4.9%
40-49 yrs.	9.0%
50-59 yrs.	11.6%
60-69 yrs.	18.5%
70-79 yrs.	22.0%
80-89 yrs.	10.7%
90-99 yrs.	2.5%
100-109 yrs.	1.2%
110-119 yrs.	0.5%
120-129 yrs.	0.4%
Open/brush	4.1%

The above information is also displayed in the chart below.

Chart #3: Alternative 2 - Ageclass Distribution



Alternative 3: ***Approximately 34 acres*** of existing open land would be maintained by ***prescribed burning.*** The effects of ***old growth*** vegetation would be similar to those described in Alternative 2, however, ***one hundred ninety-nine (199) acres*** are proposed for a total of ***751 acres*** designated under this alternative. ***Clearcutting***, ***seed tree seed cutting, planting and release*** would occur in the same locations and consequently have the same effects as those described in Alternative 2. ***Shelterwood seed cutting*** would occur on an additional 40 acres (total of ***73 acres***) under this alternative. Effects would be similar to those described in Alternative 2 except oak would also be the predominant shelterwood species (although pine, where present, would also be a component) in Compartment 284, stand 28.

Shelterwood preparatory cutting would occur on an additional 32 acres (total of ***89 acres***) under this alternative. Effects would be similar to those described in Alternative 2. ***Salvage cutting*** would occur on an additional 35 acres (total of ***149 acres***) under this alternative. Effects would be similar to those described in Alternative 2. ***Commercial thinning*** would occur on approximately ***1,262 acres*** under this alternative. Effects would be similar to those described under Alternative 2.

Uneven-aged management group selection (group openings) would be implemented on ***approximately 66 acres*** in conjunction ***with improvement cutting (commercial thinning between group openings)*** *on* ***approximately 586 acres*** in thirty-seven stands under this alternative. Using methods and with effects similar to those described in Alternative 2, ***sixty-six acres*** of oak/hickory/pine regeneration would be anticipated from group cuts and post-harvest ***non-commercial timber stand improvement/reforestation cutting*** would occur on ***approximately 586 acres.***

Precommercial thinning would occur on the same areas ***(approximately 439 acres)*** and with the same effects as those described in Alternative 2. There would be no ***pine woodland development*** initiated under this alternative. ***Approximately 34 acres*** of existing open land would be maintained by ***prescribed burning***

The following age-class distribution would result from implementing Alternative 3:

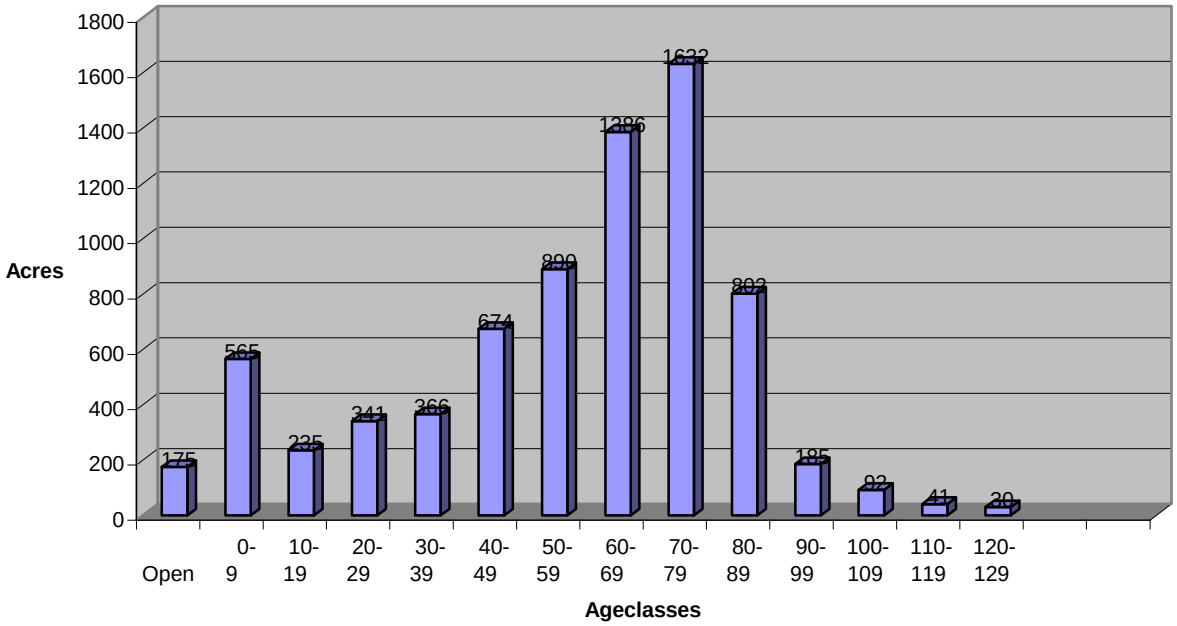
Table #13:

Age-class distribution

Age-class	Percentage
0-9 yrs.	7.6%
10-19 yrs.	3.2%
20-29 yrs.	4.6%
30-39 yrs.	4.9%
40-49 yrs.	9.1%
50-59 yrs.	12.0%
60-69 yrs.	18.7%
70-79 yrs.	22.0%
80-89 yrs.	10.8%
90-99 yrs.	2.5%
100-109 yrs.	1.2%
110-119 yrs.	0.5%
120-129 yrs.	0.4%
Open/brush	2.4%

The above information is also displayed in the chart below

Chart #4: Alternative 3 - Ageclass Distribution



.

Cumulative Effects

The area of consideration is the 4.1-12 Management Area (MA) (9,524 acres) and the planning period considered is 1999-2008. The percentages shown below in Table #14 reflect the cumulative area of National Forest where effects corresponding to these activities have occurred (Alts. 1-3) and would occur (Alts. 2-3):

Table #14:

Type of Harvest	Alt. 1	Alt. 2	Alt. 3
Regeneration cuts 1/	1%	6.3%	6.9%
Other regeneration cuts:			
Single Tree Selection	0%	0%	0%
EAM Intermediate Cuts 2/	4%	23.2%	19.8%
UAM Intermediate Cut	1.2%	5.2%	7.3%
Release/Precommercial Thinning 3/	1.8%	10.5%	12.6%
Open/Semi-open (cut and/or burn)	2.2%	3.6%	2.2%
Designated Old Growth	9.8%	11.4%	11.9%

1/ regeneration cuts associated with producing a distinguishable 0-9 age class, i.e. clearcut, shelterwood seedcut, seedtree cut, and group selection.
2/ includes overstory removal, shelterwood prep. cuts, commercial thinning and salvage cutting.
3/ also includes non-commercial UAM follow-up treatments between group openings.

Based on 1986 and 1999 aerial photos, the following figures represent the type and extent of change relative to all lands (16,254 acres) in the 4.1-12 MA between 1986-99:

Table #15: % Cumulative Change

Change Class	**NFSL**	**Private Land**	**Total**
Forested	0	-3	-3
Open land	0	+1	+1
Semi-open	-1	+2	+1

Timber harvesting and grazing on private land are likely to continue in the foreseeable future. Conversion of timberland to pasture would affect the open land(+) and forested (-) categories in the above table. Heavy cutting without reforestation work would temporarily affect the forested (-) and semi-open (+) categories. Reforestation of open and semi-open lands would decrease these categories and increase the forested category. The potential of timber harvesting effects occurring as a result of harvesting to supply the chip mill at Mill Spring is diminished for the near future due to significantly lower mill production. The potential to improve private timberlands by removing low-value excess or low quality trees is likewise diminished. If trends in land use practices in this area continue in a manner similar to those in the remainder of the Current River Pine-Oak Woodland Dissected Plain LTA, it is likely there will be less forest and more open land or developed land on private land in the near future.

Peck Ranch State Conservation Area (approximately 23,098 acres) borders the NE Corner Project Area on the east side. Management activities within this area include prescribed burning of warm season grasses, dolomite glades, igneous knobs and pine woodland restoration sites. An average of 2000 acres is burned annually. Expectations are to burn 52%, approximately 12,000 acres, of the Conservation Area on a rotational basis. Prescribed burning has been conducted for several years in conjunction with silvicultural practices that are very similar to the practices identified in the Land and Resource Management Plan for the Mark Twain National Forest.

Four compartments (approximately 3903 acres) of the Rocky Creek State Conservation Area border the north boundary of the NE Corner Project Area. Within these compartments the following management activities have been planned or conducted: 10% even-aged regeneration (clearcut, shelterwood or seedtree harvests); 34% intermediate harvests; 13% uneven-age harvests. The desired future management condition calls for retaining 98% of these areas in a forested condition and approximately 2% in open/semi-open conditions.

Biological Diversity

The Council on Environmental Quality in January 1993 published "Incorporating Biodiversity Considerations Into Environmental Impact Analysis Under the National Environmental Policy Act". Pages 6-8 of that report outlined 11 General Principles, which are intended to help managers and planners identify biodiversity concerns and seek solutions in specific situations as agencies pursue their diverse mandates. The 11 General Principles below look at existing condition, direct/indirect, and cumulative effects.

1. Take a "big picture" or ecosystem view.

Existing Condition

The NE Corner Project area is within the Current River watershed, in the Oak-Pine Breaks and Hills Land Type Associations of the Ozark Highlands. A discussion of the broader context of this project area can be found in the Appendix D, under the topic “Water Analysis”. The project area is composed of oak-hickory and oak-pine forest in various successional stages. Historic and natural disturbance factors include fairly frequent low intensity fires, with infrequent high intensity (or stand replacement) fires; windstorms & tornadoes; insect/disease mortality; occasional summer drought or late spring frost; ice storms; and flash flooding in intermittent drainages.

Direct/Indirect Effects

In all of the alternatives, several things will remain the same. The highways & roads will continue to exist, but may be altered, improved or relocated. Natural disturbances, such as windstorm, ice storms, frosts, insects/disease will continue to affect the project area. Fire protection will continue because it is a policy of the Forest Service to protect resources from wildfire, and because the proximity of private lands & dwellings makes it imperative. The local economy will continue to rely on wood products - which will be removed from private lands as well as other public lands. Hunting, fishing, trapping and other recreational pursuits will continue.

Cumulative Effects

The action alternatives are intended to use traditional kinds of disturbances (primarily prescribed fire and careful logging) in an environmentally sensitive way to create & maintain natural communities in all their successional stages. Out of this will come a sustainable supply of goods & services.

2. Protect communities and ecosystems.

Existing Condition

The pine and oak-pine forest with all their successional stages are the primary communities in the project area. There are subtle differences in vegetation depending on Ecological Land Type (soil & aspect). Special habitats within this project area include: eight sinkhole ponds, Marg Pond Natural Area (state designated natural area), one small glade, approximately 0.5 acres in size and 1829 acres of shortleaf pine forest.

The 4.1-12 management prescription "emphasizes the management of shortleaf pine in its natural range on sites where it is recognized as a dominant or characteristic member of the natural community." (page IV-125 Forest Plan).

Direct/Indirect Effects

Alternative 1 (No Action) would mean that no proposed actions would be implemented but change would occur through natural disturbance regimes. All communities present would continue to exist, although the amount of each community type might fluctuate over time. Fire protection would keep wildfires to a minimum. Open woods would only exist where the soil is poor. The oak-hickory-pine communities would continue to grow and mature, with many small openings created by natural mortality of individual trees and some larger openings created by windstorm, ice damage, insect/disease, or other disturbance. A large percent of the area would eventually be in mature and old growth successional stages with only a small amount of early successional stages. Roads would still exist and be used.

Marg Pond Natural Area would be protected from disturbance by designation of surrounding stands as old growth or because no activity is planned. Sinkhole pond communities would be protected by Mitigation Measure or because no activity is planned.

Open woods (an overstory of medium to large size trees with few midstory trees and abundant ground cover of grasses and forbs) would be recreated and maintained on approximately 660 acres through a combination of commercial harvest and prescribed burn in Alternative 2.

Cumulative Effects

Successional stages of the oak-hickory-pine communities would be created several ways. In Alternatives 2 & 3, regeneration harvests would create early successional stages of oak-hickory-pine forest, with openings ranging in size from 5 acres to 40 acres. Individual tree selection harvests would create small openings similar to those caused by natural tree mortality. These acres would have some value for early successional species, while at the same time maintaining a largely unbroken canopy of forest preferred by mid-successional species. Early successional openings of 1/3 - 2 acres would be created through group selection. Designation of old growth would ensure late successional communities would be available into the future.

3. Minimize fragmentation. Promote the natural pattern and connectivity of habitats.

Existing Condition

The project area is National Forest System land with 3281 acres of private land within the NE Corner Project Area. Much of the private land is in permanent openings (mostly fescue pasture). National Forest land is 97% forested, with 140 acres of open field and 35 acres of brushy openings. The forest area is composed of several forest types in varying successional stages. Adjacent lands include additional National Forest System lands south and west; Missouri Department of Conservation public lands (Peck Ranch and Rocky Creek Conservation Areas, east and north, respectively); and private lands interspersed through the central and southern sections of the project area.

State Highway 19, a 2-lane asphalt road is a barrier to movement going west and separates the project area from other National Forest lands. US Highway 160, a 2-lane asphalt road is a barrier to movement to the south. State Highway H, a 2-lane asphalt road dissects the project area.

Direct/Indirect Effects

Alternative 1 - See discussion in #2 above.

The actions proposed in Alternatives 2 & 3 are designed to imitate this variety of age classes, sizes and species distribution. No permanent changes in land use are planned (i.e. the forest areas will remain forested), nor would there be any conversion of one species to another.

Permanent openings on National Forest System land are limited to 140 acres of open field and 35 acres of small brushy openings. Open woods would be created through cutting and prescribed burning 660 acres of pine woodland communities in Alternative 2.

Cumulative Effects

Temporary openings of several sizes would be created through commercial timber harvest. Regeneration harvest of up to 40 acres would be created by even-aged cutting methods. Many small openings would be created through single-tree selection. Openings of 1/3 - 2 acres in size would be created by group selection. All these openings would consist of regenerating oak, hickory, pine and associated trees; small fruiting trees such as dogwood; shrubs and vines such as blackberry and greenbrier; and annual & perennial forbs and grasses. As the regenerating trees grow, the lower vegetation would slowly be shaded out and eventually the opening would cease to exist. These temporary openings reduce the amount of continuous forest canopy (but are still part of the forest community) and provide early successional habitat for a short period of time (up to 10 years).

Temporary edges would be created where even-aged harvest adjoins mature forest. These temporary edges would be young forest against immature or mature forest and would last for about 10-20 years (or until the new regenerating stand grows tall enough function as immature forest). There would be no new permanent edges created. The existing brushy openings and open fields would be maintained in their present condition.

Old growth designations in Alternatives 2 & 3 were selected to create blocks of continuous old growth habitat, and provide buffering around a designated natural area. Alternative 1 designates no old growth, but the entire area would continue to grow older since no vegetation manipulation would be done.

Private land uses are likely to remain much the same as in the past 10 years (homes, outbuildings, pastures, hayfields, small woodlots) . If timber prices remain high, it is likely that cutting on private land will continue or increase in amount and intensity. It is also possible that additional woodland would be cut and/or bulldozed to create permanent pasture.

4. Promote native species. Avoid introducing non-native species.

Existing Condition

There are no actions proposed in any alternative, which would introduce non-native species or manage native species on unsuitable sites. Perpetuation of a healthy and diverse oak-hickory/oak-pine forest community is one of the primary goals for this project area.

Direct/Indirect Effects

There would be no intentional introduction of non-native species in any Alternative. In addition, there would be no management of native species on inappropriate sites in any of the Alternatives. The oak-hickory-pine communities and their successional stages would be maintained in the action alternatives.

The temporary openings created through even-age management in Alternatives 2 & 3 would create opportunities for naturalized non-native annual and perennial plants such as ox-eye daisy, Queen Anne's lace, foxtail and knapweed. However, native annual & perennial plants would also be found in those areas.

Cumulative Effects

Mitigation Measures are used to eliminate non-native vegetation being introduced into natural communities. Annual cover crops (winter wheat, annual rye or oats) are used to hold soil until native herbaceous vegetation is established. Native plant growth is encouraged by using fertilizer on bare ground created through management actions.

5. Protect rare & ecologically important species.

Existing Condition

A Biological Evaluation (BE) for these species was conducted and the results are in Appendix H. There were no federal listed species documented to occur in the project area. There is no critical habitat for any species in the project area, on the Doniphan/Eleven Point District, or on the Mark Twain National Forest. The BE discusses potential effects to federal species which could possibly occur in the area or that the project potentially affects, and concludes that there would be no additional effects to these species beyond those discussed and evaluated in the 1998 programmatic Biological Assessment and 1999 programmatic Biological Opinion. The BE also determined that the activities proposed in the NE Corner project area (and all alternatives) comply with the Reasonable and Prudent Measures and Terms and Conditions of the June 23, 1999 US Fish and Wildlife Service's Biological Opinion. The US Fish & Wildlife Service has reviewed the Forest Service BE and concurred with it's findings on May 16, 2002.

There are known locations for Regional Forester Sensitive Species in the project area. The BE discusses potential effects to RFSS listed species which could possibly occur in the area and concludes that there would be No Impact to RFSS as a result of the actions proposed in this document.

There are two state endangered species known to occur within the project area. They are Cooper's hawk and sharp-shinned hawk. Both species were documented with active nests in the 1980's. Potential habitat does exist in the project area, and that habitat would be maintained in any alternative. There would be no effect on state-endangered species as a result of implementing the action alternatives. Discussions of the March 8, 2001 SIR, incorporated by reference, and a discussion of neotropical migratory birds can be found in the Appendix D.

Direct/Indirect Effects

Alternative 1 would provide an abundance of mature to old growth oak/hickory/pine forest. However, much of the project area is less than 1 mile from private lands with permanent agricultural openings. This could limit the suitability of this habitat for those species, which require larger blocks of forest interior. The primary method to develop shrub habitat is to conduct even-age management harvest; and since none of this would occur, shrub habitat would be very scarce.

Even on private land, approximately ½ of the lands are open fields consisting of grazed fescue pasture with very little shrub development. Those neotropical migrants which depend on this habitat for breeding (blue-winged warbler, white-eyed vireo, prairie warbler, chat, etc.) would not find suitable habitat within the project area. There would be no fragmentation of forest-land by non-forest land uses; and only natural fragmentation of forest types, communities, age-classes and successional stages.

Alternatives 2 & 3 would have varying sizes of old growth forest, areas of single tree and group selection harvest creating small openings in the canopy, and areas of shrubby habitat created through even-age regeneration harvest. Single tree selection harvests and areas of no treatment would create a variety of canopy closures from light to moderate to dense. This in turn, would allow a wide variation in amounts and types of ground flora available throughout the project area.

This would provide suitable habitat for a wide variety of neotropical migrant species, although numbers of each species might be lower or higher than in other alternatives due to the amount of each habitat available. Mature forest species would be lower, "gap" species would be slightly higher and shrub species would be slightly higher.

Cumulative Effects

In Alternatives 2 & 3, there would be no fragmentation of forest-land by non-forest land uses; only natural fragmentation of forest types or communities; and some fragmentation of forest age-classes and successional stages. The differing age-classes and successional stages would leave the forest matrix intact and would continue to provide the mosaic of age-classes and successional stages common in the area for the past 20-30 years.

6. Maintain unique or sensitive environments.

Existing Condition

See #2 for information about special communities.

Direct/Indirect/Cumulative Effects

Marg Pond Natural Area is located in Compartment 280, Stand 4. It lies along the southern border of the project area and is separated from much of the project by private lands. No activities will occur within this stand. The surrounding stand and those, which lie to the north and east, are designated for old growth.

7. Maintain or mimic natural ecosystem processes.

See discussions #2 and #3 above.

8. Maintain or mimic naturally occurring structural diversity.

Existing Condition

See also discussions in #2 and #3 above. Historic and natural disturbance factors include fairly frequent low intensity fires, with infrequent high intensity (or stand replacement) fires; windstorms & tornadoes; occasional summer drought and/or late spring frosts; insect/disease mortality; and flash flooding in intermittent drainages.

These disturbances formed a mosaic of successional stages of the oak-hickory/oak-pine forest. Small openings resulting from windthrow, insect/disease, or natural mortality were probably frequent, with larger openings caused by stand-replacement fires, drought, frost and tornadoes probably infrequent across the landscape. In addition, soil fertility helped determine the species composition and density of vegetation. Poorer soils had less density of tree species and more herbaceous understories, while richer soils had a higher density of tree species along with a varied mid-story of shrubs and small trees and less herbaceous ground cover.

Direct/Indirect Effects

Actions, which create the larger stand-replacement openings include even-age harvest techniques of clearcut, seedtree, and shelterwood seedcut. Uneven-age management harvest (either single tree or group selection) would create the smaller and more numerous openings typical of most natural disturbances. Prescribed burning of selected areas would recreate and maintain open woods conditions prevalent on ridges, southwest slopes, and poor soils.

Cumulative Effects

Designation of old growth allows formation of the older, latesuccessional stages, which have been lacking since the late 1800's/early 1900's. Information on many ecosystem processes (such as hydrologic regimes, nutrient flows, inter-species relationships) is sparse, particularly as relates to the Missouri Ozarks. Alternative 1 would come the closest to allowing natural processes to operate. There would still be human-caused impacts, but they would be caused by activities other than those proposed in this EA.

Both even-age and uneven-age management would take place in Alternatives 2, 3 & 4, creating openings ranging from 1/4 acre to 30 acres. Prescribed burning to encourage growth of herbaceous ground cover and old growth designation would add to the diversity of community types present in the project area.

9. Protect genetic diversity.

Existing Condition

"To preserve genetic adaptations, species should be maintained in natural habitats across their natural ranges, and plants and animals for reintroduction should be selected from ecologically similar areas as close to the restoration site as feasible." (page 7 CEQ).

Direct/Indirect Effects

Only natural vegetative disturbances or human-caused wildfires would affect the project area in Alternative 1. The area would move toward a higher percent in mature or old growth successional stages with very little in early successional stages.

Populations of species adapted to hot, sunny & dry conditions would likely decrease and populations of species adapted to more shady, cool, and somewhat moister conditions would likely increase. In this case, genetic adaptations would be more difficult for those decreasing populations and easier for those increasing populations.

There would be no attempt to physically move any plant or animal species from somewhere else into the NE Corner Project area in any alternative. However, Alternatives 2 & 3 attempt to maintain the type and amount of disturbance which create a mix of "natural habitats" within the oak-hickory-pine ecosystem.

Cumulative Effects

A range of successional stages would be provided (see discussions in #2,7,8) and non-native species would be discouraged (see discussion under #4). By maintaining the range of successional stages of communities on appropriate sites, genetic variations and the ability to adapt are also maintained.

10. Restore ecosystems, communities, and species.

Existing Condition

Species extirpated from Missouri within historic times include: red & gray wolf, cougar, red-cockaded woodpecker, elk and bison. The Missouri Department of Conservation is responsible for wildlife populations and at present, has no plans to attempt reintroduction of any of these extirpated species. Species successfully recovered or reintroduced in the Lower Ozarks from the 1930's until the present include: deer, turkey, beaver, ruffed grouse and river otter.

Some species, which are relatively uncommon in Missouri are naturally moving back into the state. In the past several years, black bear and armadillo sightings have been more frequent in the Lower Ozarks and near the project area. It appears that both these species are expanding their ranges by moving into southern Missouri from adjoining states. The Missouri Department of Conservation has a Black Bear Management Plan, but has no immediate plans to actively reintroduce bears to the state. They are monitoring bear sightings and responding to situations where bears and people come in conflict. Armadillos make recurring attempts to move north and are usually decimated during extended periods of extremely cold weather. The last several winters in south Missouri have been relatively mild, allowing the expansion of armadillo populations.

Natural communities, which have been altered or reduced within historic times in this area include: open woods and old growth. Open woods typical of poor soils and/or ridgetops have been gradually replaced by forests with more woody understory plants as fire protection kept out frequent low-intensity fires. Old growth forests were almost completely wiped out during the logging boom of the late 1800's and early 1900's. See #2,5,6,7,8 for discussions of how natural communities would be affected by each alternative.

11. Monitor for biodiversity impacts. Acknowledge uncertainty. Be flexible.

Existing Condition

Because ecosystems are so complex and the interrelationships so difficult to understand, there is much research being done on various aspects of ecosystem composition, structure and function. In Missouri, efforts are underway by the Missouri Department of Conservation, Missouri Department of Natural Resources, United States Geological Survey, USDI National Park Service, Forest Service, the Missouri Universities, and other organizations or private businesses to study many of these subjects (See Appendix G for examples of ongoing work).

At the present time, there are no studies being done specifically within the NE Corner project area. This area would be available for future research/studies under all Alternatives.

Monitoring specific to the project area would include first and third year regeneration surveys in shelterwood seedcut, seedtree cut and clearcut areas, monitoring conducted as part of timber sale contract administration to mitigate impacts on soil, water quality, and residual vegetation, and visits to the project area to informally compare the results of project implementation with expectations.

12. Incorporate human needs.

Existing Condition

Several objectives of the Forest Plan incorporate human needs as a part of management of the ecosystem. In particular, the 4.1 Management Prescription has as some of its purposes: "provide for the economically efficient production of shortleaf pine timber products."; " provide dispersed recreation opportunities"; and "provide for production of other resources such as hardwood timber products, recreation, forage, fish and wildlife, and minerals." (Forest Plan IV-125).

These objectives can be met by maintaining traditional uses while providing for changing societal needs within the limits of ecosystem capability. See discussion under #1 about traditional uses.

Direct/Indirect/Cumulative Effects

Traditional uses such as hunting, fishing, hiking, berry-picking and horseback riding would still be possible under any alternative. Driving for pleasure would still be possible in all alternatives. Game species such as doves, rabbits, quail, and deer, which prefer early successional habitats would be less abundant in Alternative 1, therefore, hunting success might be lower for these species.

Game species such as turkey, raccoon, and squirrel, which prefer mid to late successional habitats would be more abundant in Alternative 1; thus leading to the possibility of higher hunter satisfaction. Conversely, in Alternative 2 & 3, early successional species (and hunting success) would be relatively higher and late successional species relatively lower than Alternative 1.

The existing road system would still exist in all alternatives. However, in Alternative 1 there would be only minor maintenance. Some roads might deteriorate to the point that some would only be drivable by 4-wheel drive vehicles or ATV's. Reconstruction or maintenance of the existing roads would be done in Alternatives 2 & 3 keeping them drivable by most vehicles.

There would be no commercial wood products removed from the NE Corner Project area under Alternative 1. Wood products removed in Alternatives 2 and 3. Personal-use firewood would be available with a permit in Alternatives 2 and 3. With no commercial cutting in Alternative 1, personal use firewood would be limited to permits to cut hazard trees and possibly downed trees along roads. All alternatives maintain the opportunity to provide goods & services in the future.

Social Factors

Visual Resources

The Mark Twain Land and Resource Management Plan establishes Visual Quality Objectives (VQO) for each management prescription. The VQO for a specific area is determined by relating the variety class and distance zone/sensitivity level mapped for each district to the visual quality matrix found in the standards and guidelines (2300) for each management prescription.

The North East Corner Project area is primarily in the Variety Class B- Common with a small portion to the east in Variety Class A- Distinctive. The project area is all within the Management Prescription 4.1, LRMP pg. IV-125.

The overall objective for the 4.1-12 area is to emphasize management of shortleaf pine in its natural range on sites where it is recognized as a dominant or characteristic member of the natural community. It provides for economically efficient production of shortleaf pine timber products, dispersed recreation opportunities featuring a roaded natural recreation environment, and production of other resources such as hardwood timber products, recreation, forage, fish and wildlife, and minerals, and satisfies the management requirements of 36 CFR 219.27. The compartments fall within the Oak-Pine Hills and Oak-Pine Breaks Land Type Associations.

This area has rolling, rocky topography with sinkholes and springs. The vegetation and wildlife diversity is typical for this area. Large overstory deciduous trees and pines as well as young trees and openings are interspersed in this project area. The road surfaces are blacktop and gravel, with an average low travel speed.

Existing Conditions

The North East Corner Project area has a Visual Quality Objective (VQO) of Partial Retention (PR) along the Sensitivity Level 1 travelway Highway 60 in the Variety Class B to Modification (M) for the majority of the rest of the area, which is located primarily in the Variety Class B-Common and a small portion in the east in Variety Class A-Distinctive along Sensitivity Level 3 roads. These areas are associated with the seen area from sensitive travelways or specific use areas. Management activities such as timber harvest must be subordinate to the characteristic landscape. The general appearance is that of a natural appearing forest with some evidence of previous activities including timber harvest.

> "In areas having a Visual Quality Objective of Retention and Partial Retention, the negative visual impacts will be mitigated concurrently with or immediately after each phase or activity. Mitigating measures will be completed for each cutting unit or project area before beginning activities in the next sequential block or project area in the same corridor/viewshed. The total lapsed time from initiation of activities to completion of obligations specified by a contract or a project prescription shall not exceed one year for any single cutting unit or project area. Emphasis will be placed on completing all work within these areas in a systematic manner within the shortest practical time.
>
> In areas having a Visual Quality Objective of Modification, the standards are the same as above except the total lapsed time from initiation of activities to completion of obligations specified by a contract or a project prescription shall not exceed two years for any sale block or project area." (Ref page IV-31 LRMP)

Highway 60 is a Sensitivity Level 1 travelway with a VQO of Partial Retention (PR) in the near foreground (0' up to a maximum 300') to Modification (M) for the activity areas which are all within the Variety Class B-Common. H highway and the portion of DD highway beginning at highway 60 extending north to the junction of FR3167 are both Sensitivity Level 2 travelways and have a VQO of PR in the near foreground area to Maximum Modification (MM). There is no proposed activity directly adjacent to DD highway. All other travelways in the project area are Sensitivity Level 3 with a VQO of M to MM.

Areas along the north side of Highway 60 for approximately 1 mile in Compartment 281 on the east side of the project area are in Variety Class A-Distinctive with no stands adjacent to the highway. Both sides of FR4264 in the east half of Compartment 282 and a small portion in the southwest of Compartment 283 are in Variety Class A-Distinctive along a Sensitivity Level 3 road with a VQO of Modification. C-282, Stands 12, 11, 10, 89, 9, 8, and 33 along the south side of FR 4264 and C-283 Stand 74 have a VQO of Modification. The majority of the area is in the Variety Class B-Common based on the Visual Management System Map for the area with a VQO of Maximum Modification. A general discussion of visual management and effects of the different types of management activities can be found in the National Forest Landscape Management Volume 2, Chapter 1-The Visual Management System Forest Service-US Department of Agriculture-Agriculture Handbook Number 462 (the Big Eye book), incorporated here by reference.

Activity is spread throughout the project area. The residue height is determined by a table using travel speed, VQO, and Sensitivity Level. (See table MTNF LRMP IV-34) The slash disposal height requirements mitigate the negative impact of the activity and shorten the length of time the slash remains visible.

Visual Resources

Direct and Indirect Effects

In assessing the visual characteristics of the NE Corner Project Area it is advantageous to do so in the context of the area in total. Yet in doing so, where site specific attention is warranted, it will be noted by compartment and stand.

All proposed actions have been reviewed by the Forest Landscape Architect through field visits and/or map review and would meet the established VQO unless specifically noted otherwise in the following discussion.

Alternative 1: No Action

No changes from the existing condition would be expected to occur. Barring natural disturbance, it is anticipated that the existing visual condition of the project area would be relatively maintained. The project area as a whole would appear as a natural mature or old growth forest in the near future. There would be less visual variety.

Under all the alternatives, there would continue to be open woods and fields due to natural low soil fertility, natural disturbance (windstorm, insect & disease, etc.) or wildfire.

Alternative 2:

Harvests would cause a reduction in number of trees per acre, create additional slash on the ground, and require temporary roads or landings that would be visible from Forest Service roads. The effects of harvest on visual values adjacent to these roads would be minor and stay within the VQO for that area. Thinning and removing the overstory would allow the remaining trees to grow larger. Opening up the understory would give the forest user an opportunity to see into the woods from the roadway at a great distance and provide an opportunity to see wildlife and varying plant material.

The burning would reduce woody fuels, encourage grasses and forbs and open the understory of weeds and brush creating a more park like appearance. This alternative would provide for visual variety. The immediate effects of the proposed burning activity would be visible only until the plants grow in the spring.

This alternative would have management activity visible primarily along Sensitivity Level 3 travelways, intermittently spaced along the road, with stretches of no activity visible. In Compartment 280, Stands 8 and 3 may have activity that could be seen from the Sensitivity Level 1 road, Highway 60 in the Variety Class-B. (see descriptions of mitigating measures below).

Alternative 3:

This alternative would appear visually similar to alternative #2 with the following changes: There would be fewer acres burned and it would appear less open with the changes in the harvest prescriptions.

Cumulative Effects on Visual Resources

The scope of cumulative effects on visual resources is limited to the area from which the proposed and past treatment areas can be seen. Evidence of previous management practices is visible from some of the roads. Private land management, including cattle grazing, timber cutting, and conversion of woods to pasture can also be seen near the project area. Because theses past activities are visually evident, the proposed actions would not change the overall character of the landscape.

All alternatives would meet the assigned visual quality objectives of partial retention to maximum modification for the project area due to seen area and mitigation. The use of site-specific mitigations measures that follow Forest Plan standard and guidelines as described for the alternatives would aid in meeting those objectives. The cumulative effects of past cutting, the proposed treatments, and activities in the reasonably foreseeable future would result in a forest area that is natural appearing.

Private land uses are likely to remain much the same as in the past 10 years. Much of the private land is farmland and is interspersed throughout the project area. There are dwellings and outbuildings on the private land and varying farm and timber practices.

In all of the alternatives, several things would remain the same. The highways & roads would continue to exist, but may be altered, improved or relocated. Natural disturbances, such as windstorm, ice storms, frosts, insects/disease would continue to affect the project area. Fire protection would continue because it is a policy of the Forest Service to protect resources from wildfire, and because the proximity of private lands & dwellings makes it imperative. The local economy would continue to rely on wood products - which would be removed from private lands as well as other public lands. Hiking, trail riding, hunting, fishing, trapping and other recreational pursuits would continue.

Alternative 1 would mean that only natural disturbances would occur. All communities present would continue to exist, although the amount of each community type might fluctuate over time. Fire protection would keep wildfires to a minimum, so it is unlikely that fire would be a factor. The oak-pine communities would continue to mature and decline, with many small openings created by natural mortality of individual trees and some larger openings created by windstorm, ice damage, insect, disease, or other disturbance. A large percent of the area would soon be in mature and old growth successional stages with only a small amount of early to mid successional stages. Roads would still exist and be used.

Alternatives 2 & 3 would allow for regeneration of the maturing and declining stands and identify the areas of old growth to maintain. Open woods (an overstory of medium to large size trees with few midstory trees and abundant ground cover of grasses and forbs) would be recreated and maintained through a combination of activities. The areas along travelways and private land would contain open and forested sections on both sides of the roads, providing for visual variety.

Recreation

Current Conditions:

The project area has a recreation emphasis for roaded natural (RN) opportunities. Within the RN setting, the area is characterized by predominantly natural-appearing enviornments with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with natural environment.

Conventional motorized use is provided for in construction standards and design facilities. The probability to experience affiliation with other user groups and to experience isolation from the sights and sounds of humans is about equal. There is opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive type of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible. (Forest Plan Appendix G, Pages 1, 2 and 3)

There is one walk-in turkey area within the project area in Compartment 282. Road closures required by the Forest Plan for non-system roads not needed to enhance the current Forest Transportation System or accessing private land will enhance the turkey-hunting opportunities in this area. Recreational opportunities that do not depend on an extensive road system, just access to scattered locations, such as bird-watching or hiking, should also be enhanced with road closures.

Recreation opportunities and uses in these management areas are similar to those found in many areas across the Doniphan/Eleven Point Ranger District. Most general recreation use in the area occurs on weekends and consists mainly of hunting, viewing scenery, berry picking and driving for pleasure. Hiking, fuelwood cutting and ATV use all take place within the project area. . Dispersed camping occurs during the spring and fall, mostly during the hunting seasons for deer and turkey.

Recreation Resources - Direct and Indirect Effects

Alternative 1 (No Action)

The no action alternative would have minimal effects on dispersed recreation for quite some time since the character of the area would change little until the trees become older and begin dying. The project area would continue to provide opportunities for dispersed recreation, driving for pleasure, and both consumptive and non-consumptive wildlife uses. In the absence of vegetation management, the quality of deer and turkey hunting (and consequently the amount of camping), and berry-picking opportunities may be somewhat reduced after a period of time. Firewood gathering opportunities would increase as declining red oak die.

Overall, this alternative would provide roaded natural recreation opportunities. People could continue to use the remaining open Forest Roads within the project area. However, there would be only minor maintenance on these roads and therefore the condition of some of the roads could deteriorate over time. Some roads may become impassable except for 4-wheel drive vehicles.

Habitat diversity resulting from harvesting or prescribed burning (particularly early successional habitats associated with clearcutting, shelterwood seedcutting and group openings, and open/semi-open habitat associated with glade/savanna restoration) would not occur under this alternative, and consequently, opportunities to observe species associated with these habitats would likely not be as great. Conversely, the opportunity to view forest interior species would likely be greater under this alternative than under Alternatives 2 or 3.

Alternative 2

In this Alternative logging activities and skidding operations would create intermittent noise and could reduce the enjoyment recreationists get from experiencing the natural environment. The actual impact of the noise depends on the time of day and the time of year, and the proximity of the dispersed recreation user to the operation. The highest risk of recreationists encountering noise would occur at the times of highest recreation use which would be during weekends from Memorial Day to Labor Day if logging was taking place.

Another risk of recreationists encountering noise would occur during the spring and fall turkey seasons, and the deer hunting seasons (firearm and archery) in the fall, Hunters are camping and hiking throughout the proposed harvest area at these times. Hunters in the project area would be most affected if harvesting was active at that time. Fuelwood cutting activites would be made available following commercial timber sales.

Recreationists could also encounter increased traffic and adverse road conditions during logging operations which could increase the risk of accidents. The traffic problem would be mitigated by the use of signs to warn recreationists of logging traffic in the area. The road surfaces would be repaired through road maintenance deposits collected from the timber purchaser.

This alternative would also provide roaded natural motorized recreation opportunities. Under this alternative, most open system roads would accomodate passenger car traffic although several roads would likely be more suitable for pick-up truck travel. Closure of existing non-system roads would reduce vehicle access.

In the short term, timber harvesting and wildlife management activities would cause temporary disturbance or displacement of hunting and camping opportunities due to unattractive conditions, disturbance of the wildlife, and slash on the ground which makes walking difficult. Vegetation management would also have some short-term negative effect on sightseeing due to the appearance of disturbed vegetation, however, leaf-off logging, log-landing location, and slash treatment along area roads would help mitigate this effect. For several years following harvest activites the visual impacts of the regeneration cuts (clearcut, shelterwood, seedcuts and seedtree cuts) would likely be objectionable to some people, and later during the time these areas are densely stocked with saplings, recreation activities such as hiking, hunting or viewing would be diminished within these harvest areas. In the long term, improved stand vigor, wildlife habitat, and road conditions would result in improved roaded natural recreation opportunities.

Hunting opportunities would likely be enhanced in the vicinity of harvested areas due to the temporary concentration of game species, and improved visual conditions and accessibility. However, the hunting experience may be less enjoyable or productive for some hunters due to increased encounters with other hunters and/or wildlife disturbance resulting from increased access. Berry picking would also likely benefit from the increase in temporary openings. The opportunity to view a more diverse landscape and corresponding diversity of species would be enhanced as a result of savanna development activities.

The proposed regeneration cuts would remove 501 acres from dispersed recreation use for the next 20-25 years due to slash accumulation, profuse sprouting, and dense vegetation growth. While foot travel would generally be avoided in these areas during this time, deer and turkey hunting or viewing in adjacent areas would likely benefit as these cuts would provide additional habitat for these species. Some members of the public would be disturbed just knowing trees were being harvested or by viewing shelterwood and clearcut harvest areas.

The stands receiving uneven-aged management, salvage, or thinning harvest would be minimally impacted for all recreation activities once the harvest was completed because of low density of slash and only minor changes in stand appearance and structural composition.

Prescribed burning of open land areas to improve and enhance the open land characteristics would cause a temporary "blackened" appearance until vegetation resprouts or reseeds creating a green vegetative appearance. Some might not like the appearance. However, as burning effects begin to show (more grass growth and wildflowers) these areas should become more attractive for viewing and improve site distance among the trees.

Alternative 3

The effects on recreation would be similar to those described in Alternative 2, except there would be 655 acres less prescribed burning (only 34 acres of open land maintenance and an increase to 565 acres of even-aged harvest activity (clearcut, seed tree and shelterwood seedcuts) as compared to 501 acres of even-aged harvest in Alternative 2. These even-aged harvest areas would not attract recreation use for the next 20-25 years due to slash accumulation, profuse sprouting, and dense vegetative growth. While foot travel would generally be avoided in these areas during this time, deer and turkey hunting or viewing in adjacent areas would likely benefit as these cuts would provide additional habitat for these species. Some members of the public would be disturbed just knowing trees were being harvested or by viewing clearcut or shelterwood seedcut harvest areas.

This alternative would also provide roaded natural recreation opportunities. Road access would be similar to that described under Alternative 2. Negative visual impacts associated with timber harvesting would be somewhat less noticeable along several system roads due to changes in proposed activities (i.e. a small increase in old growth and uneven-age management in lieu of several regeneration cuts).

Cumulative Effects

The area of consideration includes the 4.1-12 Management. Past, present and proposed harvest activities in these management areas have affected, and will affect the visual. cumulative visual effects are discussed on pp.105. These activities have also altered and will alter the interior recreation landscape of these management areas similar to that described for the project area. Past harvest activities appear not to have seriously conflicted with recreational pursuits common to the area.

Wildfires, prescribed burns, continued recreation use, and timber sales that include regenerating, thinning, and uneven-aged management could take place in the foreseeable future in the project area. Effects of these activites would be similar to those described under direct and indirect effects. In the long term, the amount and kind of recreation in this area is unlikely to change due to the proposed projects. Some recreation use undoubtedly takes place on private land (i.e. hunting, viewing wildlife, hiking, horseback riding, off-road vehicles) and that is unlikely to change because of the projects proposed here. Individual landowners may change what types and amounts of use take place on their land for reasons of their own. Recreationists using the National Forest System land may move their use away from harvested areas (particularly regenerated areas) and into unharvested or lightly harvested areas.

The intent of any non-system road closure is to reduce/eliminate multiple entry/exit points which has the overall cumulative effect of reducing trespass and discourage poaching. However, closure of non-system roads is not always successful, and road improvement may result in more vehicle use in the area.

Adjacent private land is a mixture of timbered and open (pasture or hay) lands which have provided and currently provide a pastoral setting. Some timber harvesting has occured along sections of the forest/private land boundary and there could be additional cutting in the future. To date these activities have not been viewed as significant alterations of this setting or the recreation environment. There are no developed recreation facilities on private land, and the availability of private land for public recreational use is not known but would not likely be open to widespread public use, i.e. permission required, and if granted, likely to a limited number of individuals.

Environmental Justice

Existing Condition

Area Residents

According to 2000 Census data, 38,118 residents of Carter, Oregon, Ripley, and Shannon Counties have direct access to and are directly affected by the Doniphan/Eleven Point Ranger District. The following data summarizes the general characteristics of this population group.

Table #16	Carter	Oregon	Ripley	Shannon	Total Population	% of Population
Total Population	5941	10344	13509	8324	38118	
Gender						
Male	2917	5077	6556	4062	18612	48.8
Female	3024	5267	6953	4262	19506	51.2
Ethnic Group						
White	5739	9787	13127	7912	36564	95.9
Black	5	10	6	14	35	.1
American Indian	80	298	179	152	709	2
Other Races	117	265	197	246	810	2.1
Age						
0-17 Years	1493	2515	3352	2199	9559	25.1
18-64 Years	3504	5966	7821	4875	22166	58.2
65+ Years	944	1863	2336	1250	6393	16.8
Education Level						
High School diploma (1990)	2693	3852	3897	2693	13135	
College Degree (1990)	297	504	487	297	1585	
Median Income (based on 1997 estimate)	$19753	$19847	$19671	$19753	$19756	Average $19756
Persons below Poverty, % (based on 1997 estimate)	25.4%	23.8%	26.0%	25.4%	25.2%	Average 25.2%

The Ozark Ouachita Highlands Assessment (OOHA) found that thirty seven counties in the Assessment area experience "persistent poverty". All four of the counties that the Doniphan/Eleven Point Ranger District is located in fit into this category. A persistent poverty county is defined as a county in which persons with poverty-level incomes in the preceding year were 20 percent or more of the population in 1960, 1970, 1980 and 1990.

The racial and ethnic composition of the Assessment area changed little between 1970 and 1990, remaining predominantly white (91 percent). Overall, educational levels are relatively low in the Assessment area. In nonmetropolitan counties in 1990, 37 percent of adults 25 years and older had not completed high school (or its equivalent), and 13 percent of teenagers (ages 16 to 19) were high school dropouts. Assessment area workers, especially those living in the non-metropolitan counties with national forest lands, face higher unemployment rates than the Nation as a whole. Workers living in non-metropolitan counties with Mark twain National Forest lands face the highest incidence of full-time, but seasonal (i.e., part-year) work. The overall level of socioeconomic well-being in the Assessment area is relatively low. Median household incomes in the area were $19,208 in 1989, compared to $20,832 in Missouri, and $30,056 in the Nation.

The counties of Carter, Oregon, Ripley and Shannon average 25.2% low income and 2% minority. Missouri consists of 12.2% low income and 15% minority. Based on the 1990 U.S. Census information, minority population is less than twice that of the state of Missouri. However, the percent of low-income is twice that of the state of Missouri. This demographic information indicates the counties of Carter, Oregon, Ripley and Shannon are qualified as environmental justice communities.

The proposed action and alternatives do not pose a disproportionately high and adverse environmental, human health, economic or social effect on the counties. This finding is based on the effects contained in other portions of this Environmental Effects Section.

Effects on Consumers, Civil Rights, Minority Groups and Women

Forest Service activities must be conducted in a discrimination free atmosphere. Contract work that may be generated from this document will include specific clauses offering civil rights protection. The Forest Service will make a concerted effort to enforce these policies. Executive Order 12898 of February 11, 1994, Environmental Justice as part of the National Environmental Policy Act (NEPA), calls for consideration of the environmental, health, and economic effects on minority and low-income areas including the consumption patterns for fish and wildlife. The Northeast Corner Project would have limited direct, indirect, or cumulative affects on minorities and low-income populations. The nearest minority populations are in Poplar Bluff. This project is not expected to adversely affect any activities this group may undertake on the Doniphan/Eleven Point Ranger District. It is determined that there will be no potentially major civil rights impacts related to the proposed actions, therefore, a civil rights impact analysis and statement of findings are not required.

The impact of public lands as lands unavailable for taxes to the state or counties in which they lie was initially remedied in 1908 by passage of the Twenty-Five Percent Fund Act (P.L. 60-136). This provides dollars for schools and roads generated from taking 25% of the gross receipts of any revenue-producing activity on National Forest land. Twenty-five percent of these receipts are annually allocated on a pro-rata basis, where each county is paid according to how many acres of National Forest land is in the county. In the 1990's, National Forests saw timber receipts reduced drastically through public lawsuits against the Forest Service on timber sale after timber sale for a wide variety of environmental reasons, particularly in protecting threateneed and endangered species. The reduction of timber revenues, and consequently a reduction in the amount counties were getting via the Twenty-Five Percent Fund Act, prompted Congress in October of 2000 to pass the Secure Rural Schools and Community Self-Determination Act of 2000. One purpose of this law was to stablize payments to counties to provide funding for schools and roads that supplement other available funds. The method of payment would be to calculate the average of the three highest 25% payments that state received. This would run to September of 2006. All counties (Shannon, Carter, Oregon, and Ripley) that contain parts of the Doniphan/Eleven Point Ranger District have elected to receive their funds under the Secure Rural Schools and Community Self-Determination Act of 2000. The level of harvest or alternative selected will not have an affect on the amount the counties receive under this 2000 .law

ECONOMICS

Existing Condition

The Ouachita Ozarks Highland Assessment (OOHA) area (includes the Mark Twain National Forest) accounts for approximately 2.4% of the total United States output of forest products. The forest products industry is 5% of the industrial output, 3% of the employment and 3% of the employee compensation directly attributable in the OOHA area. Thirty-five of the 107 OOHA counties had at least double the average percentage output, employment, and/or employment compensation from the forest products industry. These counties derived an average 16% of their output, 8% of their employment, and 11% of their employment compensation from the forest products industry.

The national forests influence about 1% of the Highlands' overall employment (1.9 million jobs). Of the three principal national forest programs affecting the Highlands' economy (timber, minerals and recreation, timber has the greatest overall influence on employment, employee compensation, and total income when all three forests are considered together.

Jobs and income in Carter, Oregon, Ripley, and Shannon Counties are affected by management activities on the Mark Twain National Forest through direct employment in timber harvesting; forest regeneration, timber stand improvement, and wildlife treatment contracts; and income derived from dispersed recreation such as hunting, fishing, hiking, wildlife viewing, berry picking and so on. The economy of the area is also directly impacted by the amount of products and services that are generated from these activities on National Forest lands. In 2000 timber products accounted for 44% of the revenues derived from the Mark Twain National Forest. Minerals accounted for 55% and other sources such as recreation, range, and land uses accounted for the remaining 1%. There are 376,508 acres of National Forest land in the counties of Carter, Oregon, Ripley, and Shannon, which account for 25% of all the National Forest land in the state.

Direct and Indirect Effects on Economics

The analysis includes only variable costs associated with the alternatives. Since fixed costs, such as general administration and program management, do not change among alternatives, these costs are not included. Furthermore, the costs included in the economic analysis are only those to be incurred by the Forest Service. Costs incurred by timber purchasers or other parties are not included. The estimates are based on historical costs for similar projects on the MTNF. All of the variable costs associated with each activity in each alternative were considered in the analyses except those that could not be estimated because of unknown quantities, such as wildfire suppression, noxious weed control, and dump cleanup. All other project costs, including project analyses itself, are considered even if they apply to all alternatives. This results in negative present net values for all alternatives but it is felt that it most truly reflects the costs involved in this undertaking. It is also important to recognize that many of the values generated by the various alternatives (both positive as well as negative) involve goods and services that are not priced in the market place and are thus not represented in this comparison. These goods and services involve such things as the value of a hunting experience, a hike in the woods, watching wildlife, or the quality of water flow. There has been some research done regarding placing a dollar value on a hunting day or trip but analyses based on this would be dependent on type of wildlife hunted, etc. Suffice to say that alternatives that would most improve wildlife habitat, thus increasing wildlife numbers, would most improve the economy of the area through revenues associated with increased hunting. (See Wildlife Section). For purposes of this discussion, the only revenues considered are those with more finite estimates associated with timber production.

Effects on Economics from the alternatives, both short and long term, can be discussed under 1) employment, 2) timber products and resultant revenues to counties, and 3) net present value and revenue/cost ratio where applicable.

Employment

Table * shows the expected amount of crew weeks of employment estimated from the amount of timber produced (1 crew week is equivalent to 3 workers producing 50 thousand board feet (MBF)) and/or the amount of contract work contracted (1 crew week is equivalent 3 workers doing 45 acres of contract work in a week).

Table #17 : Crew weeks employment by alternative

	Alt 1	*Alt 2*	*Alt 3*
Crew Weeks of Timber Harvesting	**0**	**168**	**161**
Crew Weeks of Contract Work	**0**	**30**	**35**
Total Crew Weeks of work	**0**	**198**	**196**

As indicated in the table, **Alternative 1** would provide no employment in the affected counties. The difference between total crew weeks of work for **Alternative 2 and 3** is so negligible that further discussion related to employment is not warranted.

Timber Products and Revenues

Table #18 identifies the expected revenue generated from the alternatives:

	Alt 1	*Alt 2*	*Alt 3*			
Timber Sale Revenue	**$0**	**$898933**	**$860642**			

It is evident from the table that **Alternative 2** would provide the greatest revenues to the counties both in the form of products and receipts over the next 10 years. After the first 10 years Alternative 3 would produce greater revenues since 600 acres of land would be taken out of production to grow pine and grass in alternative 2.

Net Present Value

This table summarizes the analyses of relative costs and revenues of the various alternatives (See Appendix C for more economic analyses).

Table #19	***Alt 1***	***Alt 2***	***Alt 3***
Total Timber Sale Revenue of Existing and Regenerated* Stands	**$0**	**$928757**	**893064**
Total Timber Sale Costs of Existing and Regenerated* Stands	**$0**	**$559786**	**$574916**
Timber Sale Present Net Value	**0**	**$368971**	**$318148**
Timber Sale Revenue/Cost Ratio	**1**	**1.66**	**1.55**
Other Project Costs	**0**	**$285405**	**$255795**
Total All Project Costs	**0**	**$845191**	**$830711**
Project Present Net Value	**0**	**$83566**	**$62353**
Project Revenue/Cost Ratio	**1**	**1.1**	**1.08**

Alternative 1: Since there would be no activity there would be no costs of implementing the timber sales or costs of other non-sale-related activities. This alternative would not provide timber products to the local industry at this time but would not foreclose the opportunity to do timber harvesting and provide products in the future. Other proposed actions not related to timber harvest (ie: road reconstruction, timber stand improvement, etc.) that would have added to the economy by creating contracts and jobs would not be done. Demand for raw material would be shifted to other National Forest Land or private land, and raw material in declining/dead oak trees would not be utilized for wood products. Naturally, the Revenue/Cost Ratio is 1.0 and serves as a baseline to compare other action alternatives to.

Alternative 2 and 3 Comparison: As illustrated in the table alternative 2 could be considered the most efficient of the action alternatives as it has the highest Revenue/Cost Ratio. It also has a higher Net Present Value than Alternative 3 due to the higher revenues. The additional returns from timber sale products offset the additional timber sale related costs. However, the additional cost of burning makes the two action alternatives almost even out with respect to Revenue/Cost ratio when all project costs are considered. In the long run. In the long run Alternative 3 would continue to yield timber products while Alternative 2 would yield less from the area set aside to burn..

Cumulative Effects

The cumulative effects on economics from past activities, the proposed action, and future foreseeable actions are difficult to measure over the next 10 years. The affected area has gone from having the world's largest sawmills in the early 1900's to having very few mills at all in the middle 1900's. During the last 15 years, the local economy has been growing steadily with timber demand increasing 26% from 1980-1988. From 1987 to 1991 there has been a 4% increase statewide. The economy of the area is more or less proportionate to the volume processed since timber product manufacturing and logging account for a majority of employment. Currently, the local economy relies heavily on the timber products produced by the Mark Twain National Forest, as well as the indirect monetary benefits from recreation opportunities created. Timber products from harvest in the project area would help provide a source of continual economic return.

None of the alternatives would be an irreversible or irretrievable commitment of economic resources around the proposed project area. Implementation of Alternative 1 does not preclude other timber management opportunities for the future, but would create greater demands on private land to supply timber needs of the local mills. Alternatives 2 would not be a commitment to irreversible or irretrievable use of resources around the project area. There would be a commitment of approximately 600 acres taken out of the timber base, or land that can produce timber products, in alternative 3 because of the burn prescription.

Economic Cumulative Effects: The area of consideration is the remainder of the Doniphan District. Historically, timber harvesting has occurred in various locations scattered across the District. It is anticipated the volumes displayed in Alternatives 2 and 3 would be offered in five timber sales over a two year period, and consequently, would concentrate a portion of two years' offerings in this area. Also, some portion of the annual harvest activity on the Doniphan District would occur in this area for a 2-3 year period. In the long term, this scenario would be cyclic (about every 10 years), and the anticipated volume from this compartment would not preclude offerings in other areas now, or in the reasonably foreseeable future. Under Alternative 1, the anticipated volumes would be offered in other locations across the District, or would be foregone.

List of Agencies and Persons Contacted

Authors

This Environmental Assessment was prepared by an interdisciplinary team consisting of :

David Doss, Integrated Resource Analyst (NEPA), Doniphan/11PT District, Doniphan, MO.
Don Fish, Silviculturist, Doniphan/11PT District, USFS, Doniphan, MO
Keith Kelley, District Wildlife Biologist, Doniphan/11PT District, USFS, Doniphan, MO
Thomas Oldham, Supervisory Forester, Doniphan/11PT District, USFS, Doniphan, MO
Ben Wyatt, Supervisory Forester, Doniphan/11PT District, USFS, Winona, MO
Larry Furniss, Forest Fisheries Bioliogist/Water Quality, Mark Twain NF, USFS, Rolla, MO
John DePuy, Soil Scientist, Mark Twain NF, USFS, Rolla, MO
Cindy Price, Archaeologist, Southern Shared Service Area, USFS, Doniphan, MO
Ken (KC) Olsen, District Recreation Staff, Doniphan/11PT District, USFS, Doniphan, MO
Marge VanPragg, Landscape Architect, Poplar Bluff Ranger District, Poplar Bluff, MO

Consultation with Other Forest Service Personnel

Ken Haberl, Special Uses Coordinator, Doniphan/11PT District, USFS, Van Buren, MO
Amy Sullivan, Engineer, Forest Transportation Planner, Mark Twain NF, USFS, Salem, MO
Mike Pomeroy, Engineering Tech, Southern Shared Service Area, USFS, Winona, MO

Editorial Assistance

Theresa Wooldridge, Business Mgmt. Asst., Doniphan/11PT District, USFS, Doniphan, MO
Debbie Moseley, Clerk/Typist, Doniphan/11PT District, USFS, Doniphan, MO

Other Agencies Contacted

Dr. Frank Thompson, North Central Forest Experiment Station, USDA Forest Service, Columbia, MO; neotropical migrant birds & cowbird movements

Brad Jacobs, Natural History Division, Missouri Department of Conservation, Jefferson City, MO; neotropical migrant bird working group

Dan Witter and Ed Brown, Planning Division, Missouri Department of Conservation, Jefferson City, MO; economics of hunting/fishing

Rick Clawson, Bat biologist, Missouri Department of Conservation, Columbia MO; Indiana bat summer habitat

Gene Gardner, Ecologist, Missouri Highway and Transportation Department, Jefferson City, MO; Indiana bat summer habitat

US Fish and Wildlife Service, Columbia, MO; Biological Evaluation